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INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION
(of UNESCO)

# REPORT ON THE ACTIVITIES OF WORLD DATA CENTRES (OCEANOGRAPHY, MARINE GEOLOGY AND GEOPHYSICS), RESPONSIBLE NATIONAL OCEANOGRAPHIC DATA CENTRES (RNODCs), NATIONAL OCEANOGRAPHIC DATA CENTRES (NODCs)

Presented at the Fourteenth Session of the IOC Committee on International Oceanographic Data & Information Exchange (IODE)

Paris, 30 November - 9 December 1992

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WDCs, OCEANOGRAPHY REPORTS

ACTIVITIES OF WDC-A, OCEANOGRAPHY

## Oceanographic Data Management and Exchange

WDC-A, Oceanography recently reached a significant milestone in the international exchange of oceanographic station data. The Center archived data for its one-millionth oceanographic station during the intersessional period since IODE XIII (New York, January 1990). It is worth noting that only a very small percentage of these stations currently represent data observed prior to the International Geophysical Year (IGY) in 1957-58. Thus, new initiatives expected to be implemented by the WDCs for Oceanography during the coming year will likely augment these data holdings substantially by the addition of pre-1957 data. The international marine data base of WDC-A, Oceanography now contains data for more than 2,446,000 observations, including data for 1,037,000 oceanographic stations, 569,000 bathythermographs, 146,000 biological observations, and 670,000 current measurements; during the intersessional period, data for more than 150,000 observations were received. All data held by WDC-A are identified and described in CHANGE NOTICES to the CATALOGUE OF DATA. During the intersessional period, WDC-A prepared and disseminated to addressees in the international community Change Notice Nos. 42 and 43, 44 and 45, and 46 and 47.

## Marine Information Management and Exchange

Report of Observations/Samples Collected by Oceanographic Programs (ROSCOP) forms describing more than 1,100 oceanographic cruises were received by WDC-A, Oceanography during the intersessional period; the total number of ROSCOP'S now on hand exceeds 19,000 forms contributed by 34 countries. As a part of WDC-A's Data Archaeology effort, the Center is providing contractual support to assist the ICES Hydrographer's staff in key entering unprocessed ROSCOP forms held by WDC-A into ICES' automated ROSCOP system. This cooperative arrangement is expected to ultimately result in the availability on diskette of all ROSCOP forms held by the World Data Centers for Oceanography. A fully automated ROSCOP system will enhance the WDCs capability to identify available data for geographical and temporal areas of sparse data coverage, as well as project-specific data sets missing from the data centers.

During the intersessional period, WDC-A, Oceanography received more than 3,300 marine scientific publications and articles. All documents received are referenced and indexed by keyword and author in SUPPLEMENTS to the CATALOGUE OF ACCESSIONED PUBLICATIONS. Technical reports containing data are cross-referenced with appropriate entries in the CATALOGUE OF DATA.

**Time Series Data Inventories**

WDC-A, Oceanography has used its CATALOGUE OF DATA to assist the collocated U.S. NODC in compiling 3 inventories (North Pacific, North Atlantic, and the remaining oceans and seas) of oceanographic station data and CTD/STD data from ocean measurement programs that have repetitive sampling at the same locations, worlawide, for long time periods. A total of 27 North Pacific sections, 56 North Atlantic sections, and 29 sections from the remainder of the world's oceans (including North Atlantic OWS's) have been compiled. Magnetic tapes containing data corresponding to the three inventories, as well as a diskette containing inventories of the three data sets, are available from WDC-A, Oceanography and the U.S. NODC.

**Automation Development**

During the intersessional period improvements have been made to the PC-based Catalogue database; diskettes are now exchanged on a yearly basis with World Data Centers B and D. Based upon recommendations by IODE bodies, such as GE/RCDS, it is expected that the WDC's, Oceanography will be asked to undertake initiatives intended to provide information on data accessions to the IOC Secretariat on a much more timely basis, possibly utilizing the OCEANIC network and the automated Catalogue. As a cooperative service to its colleagues, WDC-A staff has provided technical advice and assistance to both WDCs B and D in implementing electronic mail hookups.

**Specialized Data Sets and Products**

WDC-A continues to add descriptions of specialized data sets and products available thru the Center to its CHANGE NOTICES. Available information and documentation necessary to describe the data holdings of each Specialized Center or RNODC are disseminated to the international community. These data sets include RNODC/MEDALPEX, RNODC/FOY, TOGA Subsurface Tropical Data Set, RNODC/Southern Oceans, RNODC/IGOSS, RNODC/Drifting Buoys, and the TOGA Sea Level Data Set. All such data sets are exchanged with WDCs B and D, Oceanography.

## Data Archaeology

Numerous historical data sets exist in the international oceanographic community that have never been deposited in Data Centers. These data are in danger of being lost to the scientific community, either because of deteriorating physical condition or the disappearance of original data managers. Data Centers must identify missing data sets, as well as those data sets that are at risk, and acquire/rescue the data to enhance their data bases. WDC-A is using several different procedures in support of Data Archaeology: (1) full automation of WDC-A's ROSCOP system and digitization of all forms; (2) utilization of historical IOC lists of Declared National Programs (DNP's) to identify missing data; (3) evaluation of literature references to identify project-oriented data sets; (4) funding support for digitization; and (5) funding support for travel, equipment, and training.

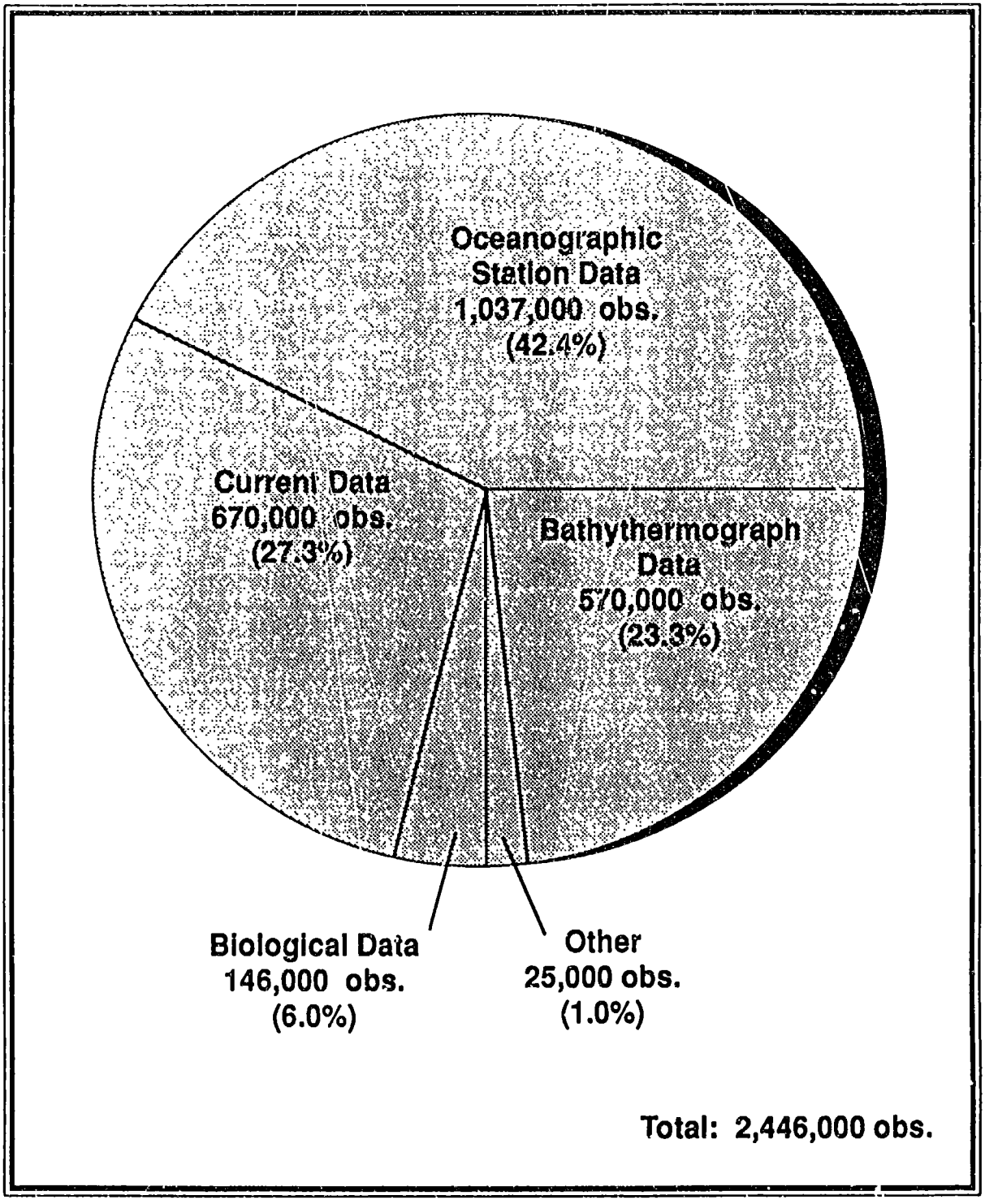
## International Data Archaeology

As the result of data archaeology initiatives, the U.S. NODC and WDC-A, Oceanography, working jointly, have received data for more than 30,000 Korean oceanographic stations, 24,000 Australian oceanographic stations, and other significant data collections; more are expected. Other international cooperative data archaeology efforts underway include digitization of Russian mechanical bathythermograph observations and oceanographic station data by WDC-B, coastal oceanographic station profiles by WDC-D, and Atlantic Slope profiles from the 1920's and 1930's by ICES.

## Data Archaeology at WDC-A, Oceanography

The WDC-A, Oceanography staff has been selecting manuscript data sets from the WDC-A archives that have never been processed by the U.S. NODC, and that are considered unlikely to be available in automated form from other Data Centers. These manuscript data are then provided by NODC to a contractor for digitization. Data for more than 10,000 oceanographic stations taken by 23 countries have been identified thus far. The diversity in years that the data were observed, as well as in geographical areas, indicates that some of these data will enhance the spatial and temporal coverage of the automated data bases.

June 1992




International Marine Data Base of WDC-A, Oceanography

ACTIVITIES OF WORLD DATA CENTRE - B (OCEANOGRAPHY)

Data exchange

During intersessional period (1990-91) oceanographic data continued to become available in WDC-B. For 1990-91 WDC-B received about 50 000 marine scientific observations, including the data of international experiments: WESTPAC - 1300 observations, KER-14800 observations, CALCOFI - 3800 observations. International marine data base of WDC-B contains data for 2688500 observations, including 104100 oceanographic stations, 525 000 bathythermograph recording, 628600 current measurements, 207000 biological observations and 266500 geophysical data.

On the basis of data delivered to the Centre the catalogues and different publications are issued. The catalogues are distributed among scientific communities free of charge.

Amount of materials delivered to WDC-B for the past intersessional period was the lowest if to consider the whole period of the IODE system functioning.

Marine information management

For 1990-91 564 ROSCOP forms have been submitted to WDC-B. The total of ROSCOP forms accumulated is 15750. These forms have been submitted by 26 countries. Every year the Centre issues and distributes free of charge the Catalogues of ROSCOP inventory forms , delivered to WDC-B. 120 marine scientific publications were also received by the Centre. The list of scientific publications and articles is published in data catalogues and oceanography materials.

International book exchange for marine sciences diciplines has

been performed in WDC-B, which dealt with 300 organizations from 80 countries. In the period 1990-91 650 publications were received and 680 were sent abroad.

WDC-B has become a deposit of the IOC publications. The services on providing the users of the former USSR with information have been realized via the national automated scientific and technical system, which provided operation in remote access.

The intercomparison of WDC-A and WDC-B Catalogues has been performed jointly with WDC-A during the intersessional period and an effort is being made to restore the identify and completeness of the WDC archives.

The development of computer-compatible media and information technologies in WDC-B

Not so much has been done in this direction which is due to severe financial restrictions.

Under financial support of WDC-A operation of telemail was provided in WDC-B international communication channels. The possibility of reading the data from optical disks has been also realized.

The automated catalogue based on PC/AT IBM compatible system has been created. The contents of the Catalogue can be made available to the other centres either in printed form and on a diskette or transmitted via communication channels.

Measures in support of the IODE system for the region of the former USSR

With current economic and political situation aggravated in the country the relations of WDC-B with marine agencies on the territory of the former USSR have been violated. The amount of

data transmitted via the international data exchange has decreased, and problems related to data achival have become also disregarded to some extent. Efforts of WDC-B and NODC have been made to support the normal operation of the IODE system in this region during intersessional period. Two meetings were held (one of them initiated by the IOC) with heads and specialists from different fields of marine sciences, where some attempts have been made to find out the possible ways of solving the problems emerged. The recommendations worked out at the meetings have been made available to the heads of marine institutions and economy branches.

## 2. INTERNATIONAL OCEANOGRAPHIC DATA EXCHANGE THROUGH WDC-B1 FOR 1991-1992

During 1991-1992 international oceanographic data exchange has been carried out in accordance with the "Manual to International Oceanographic Data Exchange", IOC Manuals and Guides No. 9, 1991 and the ICSU Guide to the World Data Center System, 1987.

The Data flow was originated by the network of World Data Centers, Responsible National Oceanographic Data Centres, National Oceanographic Data Centres, different offices, services and agencies of the countries involved in data exchange with direct coordination by the IOC and WMO.

As of June 30, 1992 the WDC-B, oceanography received data from 60 countries. Data submitted in 1991-1992, are marked with an asterisk (*).

1. Argentina
2. Australia
3. Belgium
4. Brazil
6. Canada
7. Chile
8. Colombia
9. Denmark
10. Ecuador
11. Finland *
12 Taiwan
13. France
14. Germany
16. Ghana
18. Iceland
19. India
20. Indonesia
21. Ireland
22. Israel
23. Italy *
24. Japan *
25. Mexico
26. Netherlands
27. New Zealand
28. Norway
29. Pakistan
30. Peru
31. Philippines
32. Poland
33. Portugal
34. Spain
35. Sweden
36. South Africa
37. Russia *
38. United Kingdom
39. United States *
42. Yugoslavia
43. Korea (Rep.of)
44. Ivory Coast
45. Nigeria
46. Congo (P.Rep)
47. Malaysia
48. Malagasy Rep.
49. Morocco
50. Senegal
51. Thailand
52. Turkey
53. Venezuela
60. Cuba
63. Romania
64. Arab Rep.of Egypt
70. Sierra Leone
71. Tunisia
72. Greece
73. China (P.Rep)
75. Mauritania
76. Bulgaria
77. Angola

The percentage of the international marine data base represented by each data category is given in Figure 1.

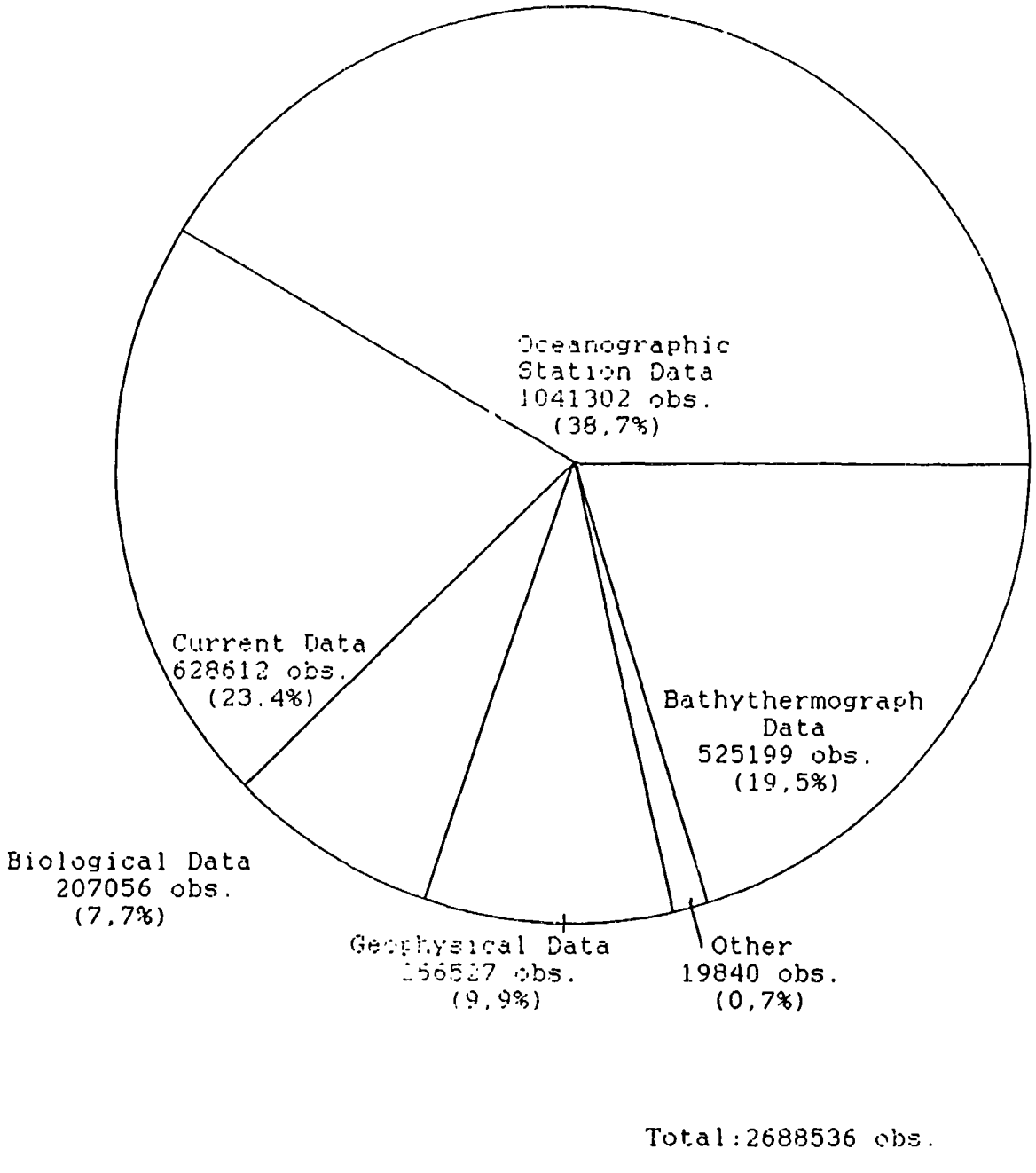



Figure 1. International Marine Data Base of WDC-B

The growth of the oceanographic station data base since 1985 is shown by years in Table 1.

Table 1. Number of oceanographic serial stations received, 1985-1992

| Year | Number of Stations received during period | Number of Stations on hand at end of period |
|---|---|---|
| 1985 | 28692 | 927689 |
| 1986 | 21080 | 948769 |
| 1987 | 36800 | 969349 |
| 1988 | 28240 | 1006649 |
| 1989 | 13270 | 1019919 |
| 1990 | 17865 | 1037784 |
| 1991 | 3518 | 1041302 |
| 1992 | - | 1041302 |

Data on Declared National Programmes were submitted to the following contries for the period 1991-1992:

| | | |
|---|---|---|
| Brazil | - | (1991) |
| Brazil | - | (1992) |
| Korea (Rep.of) | - | (1991) |
| Netherlands | - | (1991) |
| Japan | - | (April 1991-March 1992) |

## Report of Observations/Samples Collected by Oceanographic Programs (ROSCOP)

A total of 248 ROSCOP forms were received by WDC-B during 1991-1992. Tables 2 and 3 tabulate the cruises reported by ROSCOP forms. As of 30 June 1992, ROSCOP forms describing 15748 cruises had been received. ROSCOP forms have now been received from 26 nations. Data inventory forms such as ROSCOP provide WDC-B, Oceanography, and other centers with a means for determining the availability of international exchangeable data in advance of thier receipt by the data center.

## Activities of WDC-D, Oceanography

### A. Data Exchange

During the last intersessional period the data exchange was conducted between WDC-D, Oceanography and WDC-A, Oceanography, WDC-A for Marine Geology and Geophysics, WDC-B, Oceanography, WDC-B for Marine Geology and Geophysics, Permanent Service for Mean Sea Level (PSMSL), and TOGA Sea Level Data Centre. WDC-D, Oceanography also exchanged data with a number of NODCs in various countries, such as Australia, France, United Kindom, Argentina, etc.

### B. Data and Information Exchange

During the intersessional period, WDC-D, Oceanography received the catalogue of ROSCOP form publication from WDC-B, Oceanography for the period of July 1983 to June 1984, January to December 1988, and July 1989 to December 1990. WDC-D, Oceanography also received CSR Reports from the People's Republic of Korea and Republic of Korea.

### C. Data Catalogue Development

WDC-D, Oceanography has compiled and published 2 volumes of data catalogue of Chinese marine observation data and disseminated them to various NODCs and related international organizations. The catalogue volume 3 is under compilation.

### D. Data and Data Products Service

In addition to providing the data service to international users, the WDC-D, Oceanography has provided the data and data products to a number of institutions in China, such as State oceanic Administration, State Meteorological Administration, Chinese Academy of Sciences, State Committee for Education and their affiliated research institutions in the fields of marine science and technology, offshsore oil and gas, aquiculture and other marine economic development. Besides, WDC-D, Oceanography has also provided data service to those who are involved in the study of TOGA,TOGA-COARE and WOCE projects in China.

Colocated with the China National Oceanographic Data Centre, WDC-D,Oceanography shares all the facilities for data processing and data service with CNODC. With the help of U.S. NODC, Omnet communication system has been set up at CNODC, which has greatly enhanced the communications among WDCs, Oceanography and the NODCs. In order to improve the capabilities in data processing and services, CNODC is planning to update its computer system and other relevant facilities. The strengthening of CNODC indicates that the WDC-D, Oceanography will be able to manage the fast-growing international marine data gathering and data exchange.

WDC-D, Oceanography will continue to provide the service to users both from home and abroad.

**E. Visit Exchange**

During the last intersessional period, the Directors of WDC-D, Oceanography and WDC-B, Oceanography and WDC-B for Geology and Geophysics exchanged their visits. Director of WDC-D, Oceanography visited WDC-A,Oceanography. Constructive discussions were held among them on the matters of marine data exchange and possible role in which the WDCs,Oceanography would play in global marine science programs.

**F. Proposals for Further Development of WDC's System**

(i) To meet the requirements of the IODE Manual (manual and Guide NO.9), which provides the guidance on marine data exchange between World Data Centres for Oceanography, further efforts must be made by the WDCs, Oceanography.

Since three World Data Centres, Oceanography were established in different time, the quantity of data holdings is heavily unbalance. To solve this matter, a certain consultative mechanism is needed such as regular consultative meeting of the directors of WDC's.

(ii) WDCs (Oceanography) should establish close cooperative relations with NODCs and provide effective data services to NODCs and through them to the marine research institutions and scientists. To achieve this objective , WDCs (Oceanography) should find ways to let marine scientific communities know about WDCs (Oceanography) system. The training course on marine data processing technique should be organized by the WDCs, Oceanography, when necessary.

(iii) WDCs (Oceanography) should be involved in the planning of global ocean science programmes and in the field investigation for data collection, management and service on board research vessels.

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## WORLD DATA CENTER A FOR MARINE GEOLOGY & GEOPHYSICS

During the intersessional period, the World Data Center A for Marine Geology and Geophysics (WDC-A-MGG) staff were active in the international arena and in data exchanges. There was a 40% increase in marine geology data holdings and a 30% increase in marine geophysics. The Center also has 3 new exchange partner countries: Argentina, Brazil, and Cuba.

### PERSONNEL ACTIVITIES

Since the last report, the following data centers were visited by WDC-A-MGG personnel as noted:

Japan Oceanographic Data Center (Director)
British Oceanographic Data Center (Director)
World Data Center B for Marine Geology and Geophysics (staff)
World Data Center C2 for Geomagnetism at Kyoto University (staff)
Ocean Research Institute (ORI) of Tokyo University (staff)

The following meetings were attended:

Three meetings of the GEBCO committees (Director)
XIVth International Hydrographic Conference, Monaco, 1992 (Director)
Twelfth Meeting of the Central Editorial Board for the International Geological and Geophysical Atlases of the Atlantic and Pacific Oceans (GAPA) in Tokyo, Japan (staff)

WDC-A-MGG staff continue to take active roles as members of the editorial boards of the following IOC regional bathymetric charting projects:

International Bathymetric Chart of the Caribbean Sea and Gulf of Mexico (IBCCA)
International Bathymetric Chart of the Central Eastern Atlantic (IBCEA)
International Bathymetric Chart of the Western Indian Ocean (IBCWIO)
International Bathymetric Chart of the Western Pacific (IBCWP).

In support of these projects, one WDC-A-MGG scientist attended the IBCCA meetings in Caracas, Venezuela, in January 1990 and in Havana, Cuba, in March 1992; the IBCEA meeting in Lagos, Nigeria, in February 1990; and the IBCWIO meeting in Quatre Bornes, Mauritius, in July 1990.

Other WDC-A-MGG staff continue to participate in the activities of many international organizations involved with marine geological and geophysical data collection. For example, one WDC-A-MGG scientist has just been elected to a third term as the corresponding secretary of the International Marine Minerals Society (IMMS), and WDC-A-MGG has been asked by the IMMS to host the 24th Annual Underwater Mining Institute meeting in Boulder, Colorado, in the fall of 1993. WDC-A-MGG continues to interact with the IUGS Subcommission on Databases for Petrology regarding the production of a CD-ROM containing igneous petrology data (including data for oceanic rocks).

In addition, a geophysicist on the WDC-A-MGG staff completed a 3-week trip during March of 1991 to Japan as part of the US-Japan Co-operative Programme in Natural Resources. As a result, the NGDC/WDC-A-MGG Geophysical Data System (GEODAS) for management of bathymetry, magnetics, and gravity data was installed on the Japan Oceanographic Data Center (JODC) computers and JODC staff were instructed in its use.

## DATA EXCHANGE ACTIVITIES

### Marine Geology

The WDC-A-MGG endorses the International Geosphere Biosphere Program (IGBP) recommendation of international sharing of sea floor core material vital to global change research. WDC-A-MGG strongly recommends an IODE resolution supporting international co-operation to make sample material available across national boundaries, including increased sharing of information about samples available for analysis and study. In support of increased information sharing, WDC-A-MGG invites international participation in the Index to Marine Geological Samples Database.

The Index to Marine Geological Samples describes 80,000 samples curated in the United States, Canada, and the United Kingdom. Data from several thousand additional climatically significant cores from the Southern Oceans are in preparation. WDC-A-MGG is integrating photographs, text, and diagrams with existing data records to provide stratigraphic control and context important to global change research. As a first step, all of the over 70,000 pages of marine geology reports held by WDC-A-MGG were reduced to digital images, and core photographs solicited from US institutions. Cross-platform software provides access to integrated images and data records.

### Marine Geophysics

Underway geophysics holdings at WDC-A-MGG are now 35.2 million MGD77 records covering 11.9 million nautical miles of ship tracks for 3,290 cruises. There are 6.7 million miles of analog data including 5.3 million miles of analog seismic reflection data. All these data are available from the global marine geophysical data base maintained at NGDC.

On 1 June 1990, the International Hydrographic Organization Data Center for Digital Bathymetry (IHO DCDB) was officially established at the US National Geophysical Data Center (NGDC) in Boulder, Colorado, under the auspices of the IHO. NGDC's Marine Geology and Geophysics Division, WDC-A-MGG, and the IHO DCDB share resources, directorship, and staff due to their collocated operation.

The WDC-A-MGG and IHO DCDB are now actively seeking multibeam bathymetry through contributions from organizations worldwide to populate the newly developed multibeam data base. In the future, it is anticipated that CD-ROM's containing the multibeam data base will be available. WDC-A-MGG is also engaged in deliberations seeking the optimum data structure for the exchange of swath bathymetric data and digital side scan sonar imagery.

## NEW PRODUCTS AVAILABLE FROM THE WDC-A-MGG

Note: More specific information on the available CD-ROM's can be found in the Report of the Task Team on Exchange of Marine Geological and Geophysical Data.

Global Marine Geophysical Data CD-ROM Set (contains digital navigation, bathymetry, magnetics, gravity, and shot-point navigation in the NGDC global marine geophysical data base).

Gravity Image and Atlas (contains quality color images derived from GEOSAT satellite altimetry in the circum-Antarctic region).

Global Relief CD-ROM (available by the end of 1992, includes collection of worldwide relief data bases).

Marine Minerals CD-ROM (contains a comprehensive computerized bibliography and geochemical data base on offshore hard mineral resources).

Ocean Drilling Program (ODP) CD-ROM Series (contains sediment, hard rock, and underway geophysical data from ODP Legs 101-129).

DSDP Cumulative Index CD-ROM (printed version of "*Cumulative Index to the Initial Reports of the Deep Sea Drilling Project*," this CD-ROM is available only from the Ocean Drilling Program, Texas A & M).

## WORLD DATA CENTRE B - MARINE GEOLOGY & GEOPHYSICS

During the intersessional period WDC-B, MGG (Russia, Gelendzhik, Krasnodar Region) was performing its activity in the following directions:

1. Accumulation and preparation of the databases for the use along with materials on marine geology and geophysics.

2. Processing and meeting the requests for data and information.

3. Providing services and reception of the foreign scientists and specialists.

4. Collaboration with the World and national data centres, Designated national agencies.

### 1. Accumulation and preparation of the databases for the use along with materials on marine geology and geophysics

WDC-B, MGG accumulates and maintains the databases and collection materials using the following kinds and methods of marine geological research:

1.1 The database "*Sediments, Rock and Mineral Resources of the Ocean Floor*", created on the basis of the materials of 990 cruises from 32 countries for 94,300 geological stations, including the collection materials "*Photograph of the Ocean Floor*".

1.2 The database "*Results of Geophysical Work*", created on the basis of the materials of 1,890 cruises from 18 countries and the attendant data on seismic sections on microfilms and magnetic tapes.

1.3 The database "*The Results of Drilling*", including the materials of 96 cruises of the drilling ship "*Glomar Explorer*", the original file "*Rockforming Element Data of Sedimentary Rock in the Project of Deep-Sea Drilling*".

### 2. Processing and meeting the requests for data and information.

2.1 For 1990-1992, 24 requests have been granted to the scientists and specialists from 12 countries, including Turkey - 1, Greece - 1, USA - 2, China - 3 , India - 5, Poland - 3, Rumania - 1, Bulgaria - 2.

2.2 Some materials for the north-west Pacific from the data base "*Sediments, Rock and Mineral Resources of the Ocean Floor*" have been submitted in 1992 at the request of World Data Centre "D", "Oceanography" (Tianjin).

### 3. Providing services and reception of the foreign scientists and specialists.

The reception of the scientists from 13 countries has been performed and services provided for 1991-1992 (Britain, Bulgaria, China, France, Germany, Hungary, India, Japan, Poland, Rumania, Turkey, Ukraine, USA).

### 4. Collaboration with the World national data centres, Designated national agencies.

The following countries have been visited by the heads, specialists and scientists from WDC-B, MGG, where the data centers and scientific institutes are located, which collect, process and store the data and information on marine geology and geophysics:

US (WDC-A, MGG; NMGC), Bulgaria (Committee for Geology, Firm "Systemko"), Czechoslovakia (Committee for Geology, Institute of Mineral Materials), Poland (Commission for Marine Geology, Gdansk, Joint Organization "Interokeanmetal"), Greece (Institute of Geology), Berlin, Public Enterprise "Geophysics", Leipzig), Hungary (Lorand Etvesh Institute of Geophysics, Lorand Etvesh Magnetometry Laboratory), China (State Administration on the Ocean, WDC-D "Oceanography", WDC-D "Geophysics, Institute of Oceanology N3, Institute of Oceanology N2, Marine Team N2), India (National Institute of Oceanography, Goa, Department of Oceanography, India, Delhi), Ukraine (Institute of Oceanography, Odessa, Marine Hydrophysical Institute, Sebastopol), Kazakhstan (Committee for Geology, Republican Geological Fund, Alma-Ata).

## RNODC REPORTS

## RNODC FOR SOC - ARGENTINA

1. Data acquisition

In accordance with the Terms of Reference established by the Intergovernmental Oceanographic Commission for the activities of RNODC/SOC within the framework of the IODE system, the massive input of data into a master file was started in 1988. The master file originated from an initial request, when replies were received from World Oceanographic Data Centers A and B, as well as from the National Oceanographic Data Centers of Australia, Brazil, Canada, Chile, Ecuador, Germany, Japan, Uruguay, and from the Data Center of the BIOMASS program.

During the following four years, and through the publication and distribution of the RNODC-SOC Annual Report within the IODE system, details on data input to the files as well as on referential information under form of inventories, catalogues, etc., were given. This publication was also used to annually request the IODE components to send RNODC-SOC data of cruises missing in the master file catalogue.

During the intersessional period 1990/92, data pertaining to 899 stations of physical and chemical observations performed in 22 cruises were added, which means that up to date there is a total availability of 11,101 stations corresponding to 294 cruises performed by 85 vessels from 16 countries, according to the following detail:

| Country | Total Cruises | Total Stations |
|---|---|---|
| Argentina | 16 | 1,286 |
| Brazil | 4 | 111 |
| Canada | 1 | 82 |
| Chile | 3 | 101 |
| Denmark | 1 | 3 |
| Ecuador | 1 | 23 |
| Finland | 1 | 14 |
| France | 1 | 14 |
| Germany | 16 | 945 |
| Japan | 32 | 509 |
| Norway | 2 | 105 |
| New Zealand | 7 | 86 |
| Russia | 44 | 2,241 |
| South Africa | 9 | 403 |
| United Kingdom | 11 | 1,821 |
| U.S.A. | 39 | 3,357 |

A statistical analysis of the number of cruises performed in the area of the Southern Oceans sent to RNODC-SOC, shows a decrease for those corresponding to the 1980's.

This situation was exposed at the XIII Session of the Technical Committee on IODE by the Argentine representative. However, this gap could be reduced by the expected contribution of data obtained during the BIOMASS program, corresponding to some 25 cruises carried out during the 1980's by vessels of 10 countries.

2. Data and information exchange

RNODC/SOC sends annually to the World Oceanographic Data Centers an updated and corrected copy of the Master File. All available data, a catologue of cruises, a station inventory, the file design and referential information of interest are also spread through "RNODC/SOC Annual Report".

Data exchange is performed generally in the spread format design in which the data is stored, having experienced only in very few occasions the use of the General Format (GF3) with some unpreciseness.

3. Technical assistance

Making use of the training courses offered regularly by the Argentine Oceanographic Data Center in the regional level, the participants are informed about the methods and techniques used by RNODC/SOC for the processing, quality control, filing, and retrieval of the data stored in its Master File.

4. Data monitoring

The National Oceanographic Programs remain the essential information source for the monitoring of cruises carried out within the area of responsibility. Besides, information from the OCEANIC System implemented by the University of Delaware, U.S.A., has begun to be received. Another source of information are publications of Antarctic institutes of countries with interests in the region.

ROSCOP's (or CSR) forms, of internal use in the IODE sistem, are not regularly received.

5. Conclusions and suggestions

It is considered that the reception of data from the National Centers of the IODE system, in a spontaneous and systematic fashion, has not been satisfactory enough. It has been often necessary to resort to bilateral negociations between Centers in order to acquire such data. It is presumed that National Centers, in considering Southern Oceans data out of their oceanographic interest, do not store information from that geographical area. In consequence, it is deemed convenient that the data be sent directly from the Antarctic institutes of the countries that regularly send research vessels to the Southern Oceans.

It is, then, suggested to the Technical Committee on IODE the recommendation to require the Antarctic Institutes, through the Scientific Committee on Antarctic Research (SCAR), that the series of physical and chemical data obtained in such oceanic areas be sent to RNODC/SOC.

- RNODC/SOC updates the information on cruises carried out within the zone of its resposibility mainly through the regular reception of the National Oceanographic Programs (NOP). It does not happens the same with ROSCOP's (or CSR) forms that should be sent by the National Centers of the IODE System and which, perhaps due to the same reasons pointed out in the previous paragraph, are not received at RNODC/SOC.

- The exchange agreement between the German National Oceanographic Data Center (DOD) and the CEADO has been very fruitful in this regard, and the flux of data and information into RNODC/SOC has been greatly increased in the series of data as well as in the ROSCOP information. It is considered that this exchange has been greatly favoured by the bilateral agreement between both Centers.

- Taking into account the termination of the BIOMASS PROGRAM, in September 1991, it is suggested to cancel out of the Terms of Reference for RNODC/SOC the mandate for cooperation with the Data Center of that program.

# RNODC FOR DRIFTING BUOYS - CANADA

## Introduction

The Marine Environmental Data Service (MEDS) in Canada became a Responsible National Oceanographic Data Centre (RNODC) for Drifting Buoy Data on behalf of the Intergovernmental Oceanographic Commission (IOC) and the World Meteorological Organization (WMO) in January 1986. The purpose of this report is to describe the activities of the RNODC-MEDS in acquiring and making drifting buoy data available to the scientific community during the last twenty months (January 91 - August 92).

## Data Flow

We show in the table which is displayed at the end of this report various statistics derived for this 20-month period. The first column of the table gives the month and year number, the second column provides the number of messages received by MEDS for this particular month-year. The next two columns provide the statistics on the buoys themselves; it shows first the number of buoys reporting on the GTS and for which MEDS is receiving the data while the second one gives the number of buoys according to Service ARGOS. The last column gives an estimate of the success by MEDS in acquiring the drifting buoy data. Figure 1 is an illustration of the same information as it displays on the left Y-axis the number of buoys for which MEDS receives the data (continuous line) while the right Y-axis illustrates the number of messages received each month (bar chart) by MEDS.

During this time period, MEDS received a total of 1,030,305 messages transmitted from drifting buoy platforms and sent through the GTS. The average number of messages per month (51,513) for the eight months being reported for 1992 has increased by 32.9 % from the 1991 average which shows that more and more drifting buoy data are being transmitted through the GTS.

The number of buoys reporting data through the GTS has also increased significantly during the first months of 1992. The average number of buoys reporting on the GTS (according to ARGOS statistics) has increased from 621 to 914, a 47.2 % increase. The percentage of data for which MEDS receives the data through the GTS has also increased as shown by Figure 2 of this report. The upward

trend is very encouraging and shows that more and more Principal Investigators choose the GTS route for transmitting their data.

As part of the Data Management Plan for WOCE projects on Drifting Buoys, MEDS has also received from the Atlantic Oceanographic and Meteorological Laboratory (AOML) Drifting Buoy data for the 1985-1990 period. This data was processed and archived by MEDS and finally submitted to the Jet Propulsion Laboratory for inclusion in the latest CD-ROM presently being prepared for TOGA.

Following a recommendation made by the Data Management Committee on WOCE, MEDS has also recently received Drifting Buoy data from AOML for a 6-month period (July to December 1991). This latest submission is the first one being done under the auspices of the Data Management Committee. The tape is now being processed by MEDS and it contains the original ARGOS data, the P-file which is the edited buoy position file, the S-file which is the edited temperature file, the KRIG-file which is the 6-hour interpolated position being performed by AOML using their latest algorithm and one more administrative file relating buoy numbers together.

Historical Data Acquisition

From the FGGE program and since January 1986 when MEDS became the RNODC for Drifting Buoy data, the archive has grown constantly. It now contains a total of 5,281,662 messages from 3,841 different drifting buoys of which more than 85.4 % has passed MEDS critical quality control procedures. Figure 3 shows the geographical distribution by slice of 30 degrees of latitude the entire Drifting Buoy Data Base.

Services

MEDS issues an annual report summarizing the data received and processed during the previous year and showing the locations of the buoys. Every month, global maps are issued displaying the location for the buoys reporting over the GTS. In addition MEDS can also deliver data for a user specified area, time and range of buoys on computer magnetic tape in GF-3 format. If the volume of data requested is small enough, it can be obtained on computer diskette (5 1/4 or 3 1/2-inch). Displays of buoy tracks can be made for any ocean area and time frame.

MEDS has just completed the development and installation of a computer file containing information about the operators of the buoys as well as the program under which the buoy has been deployed. Other information, such as the program manager or organization and characteristics of the buoy are also kept if this information is available.

MEDS has developed an archiving mechanism for the Drifting Buoys Bulletin Board messages available each day on ScienceNet. For a particular buoy or set of buoys, all messages (if any) regarding its operational behaviour are available upon request on paper or computer diskette.

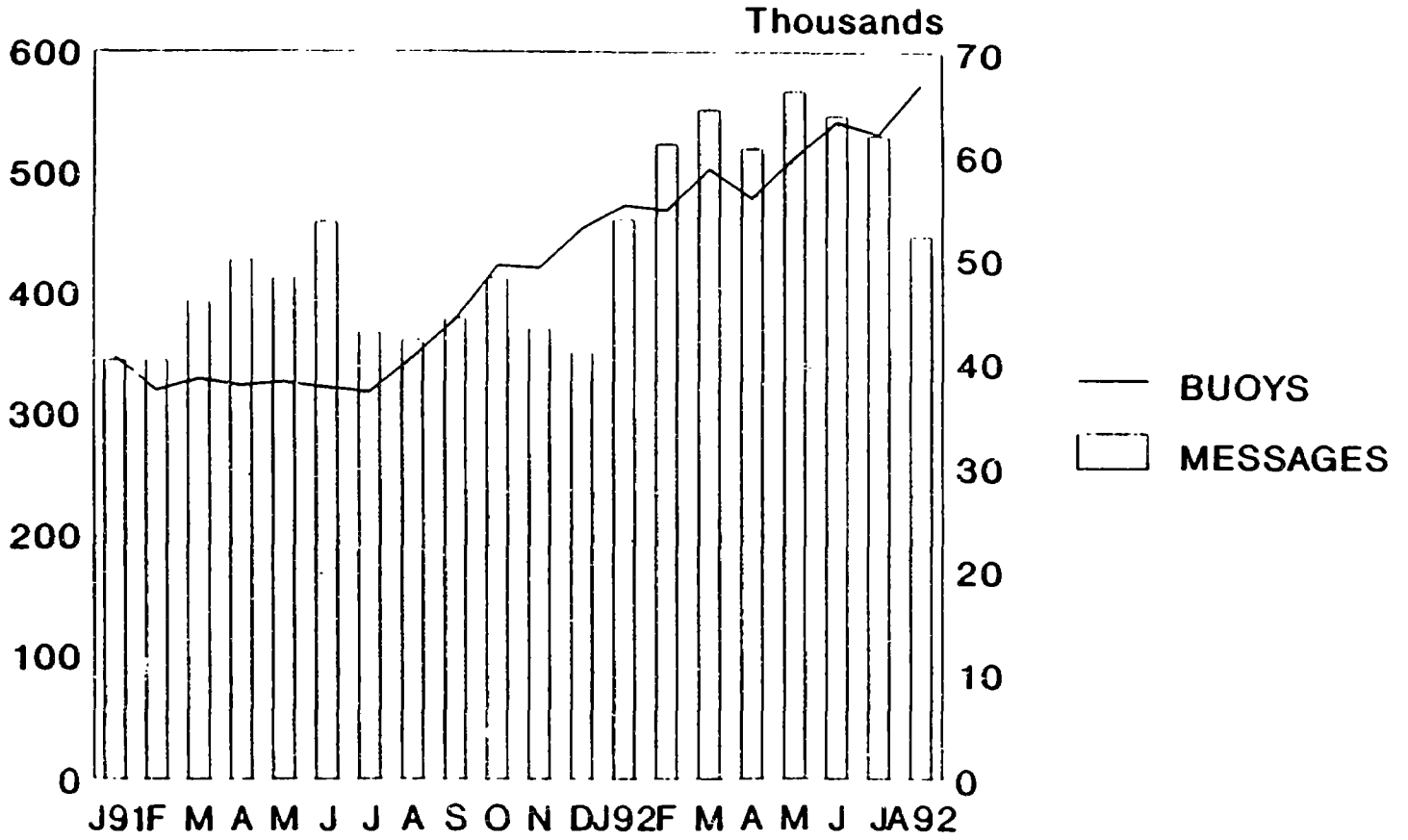
Table: Monthly statistics on number of buoys and number of messages received at MEDS from Jan 91 to Aug 92

| Month/Year | # Messages received in MEDS | # Buoys reporting on GTS | # Buoys according to ARGOS | % received in MEDS |
|---|---|---|---|---|
| Jan 91 | 40106 | 347 | 612 | 56.7 |
| Feb 91 | 45935 | 319 | 628 | 50.8 |
| Mar 91 | 49950 | 328 | 615 | 53.3 |
| Apr 91 | 48281 | 323 | 628 | 51.4 |
| May 91 | 53556 | 326 | 637 | 51.2 |
| Jun 91 | 42927 | 322 | 598 | 53.8 |
| Jul 91 | 42093 | 318 | 634 | 50.2 |
| Aug 91 | 44150 | 347 | ? | ---- |
| Sep 91 | 48127 | 378 | 745 | 50.7 |
| Oct 91 | 43232 | 423 | 726 | 58.3 |
| Nov 91 | 40923 | 421 | 791 | 53.2 |
| Dec 91 | 47035 | 453 | 833 | 54.4 |
| Jan 92 | 53787 | 473 | 848 | 55.8 |
| Feb 92 | 61099 | 469 | 900 | 52.1 |
| Mar 92 | 64377 | 503 | 893 | 56.3 |
| Apr 92 | 60659 | 479 | 896 | 53.5 |
| May 92 | 66232 | 513 | 904 | 56.7 |
| Jun 92 | 63820 | 542 | 983 | 55.1 |
| Jul 92 | 61904 | 532 | 925 | 57.5 |
| Aug 92 | 52112 | 573 | 965 | 59.4 |

Report prepared by: Paul-André Bolduc
Marine Environmental Data Service
September 1992

# Drifting Buoys

## # of Buoys vs # of Messages

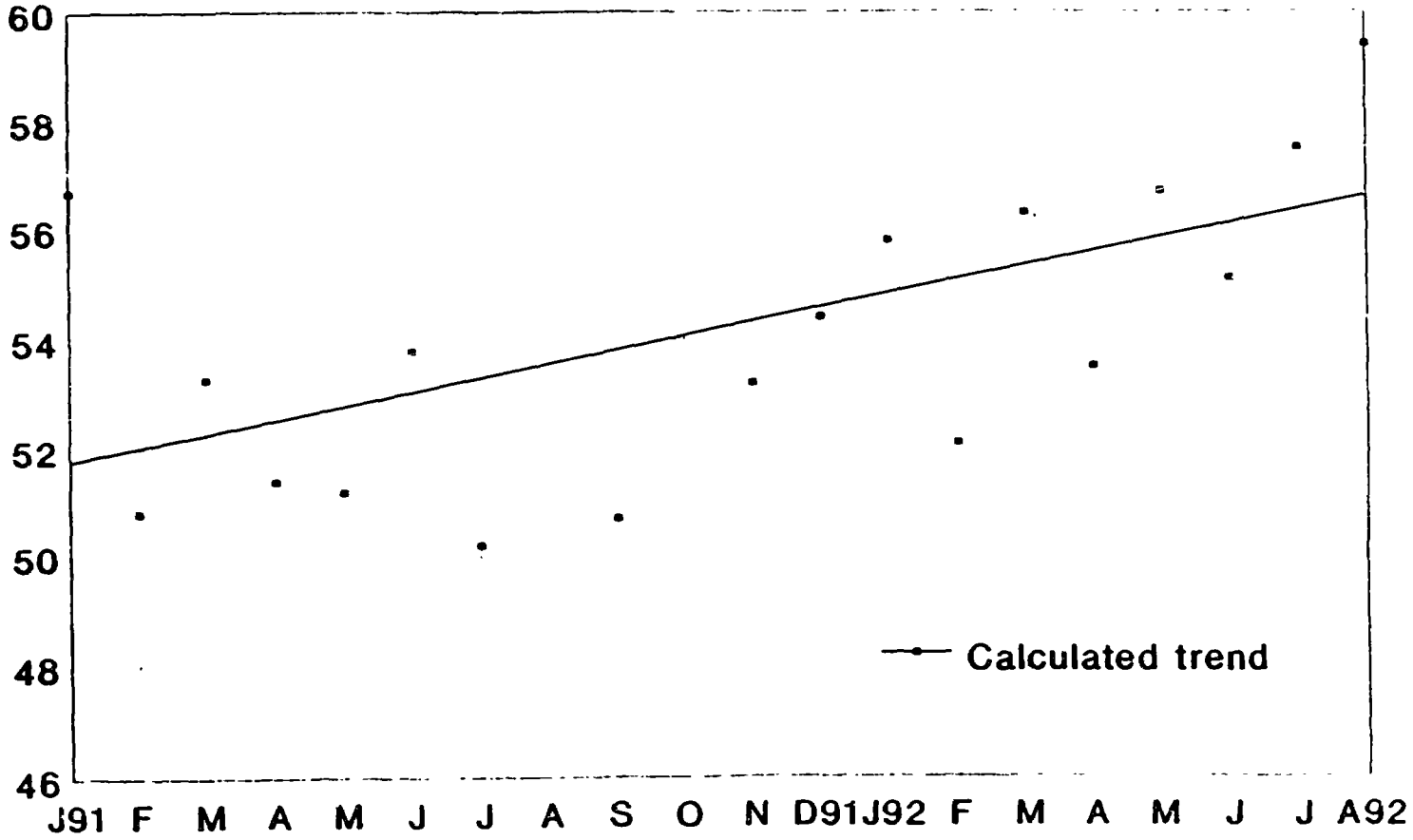



IOC/IODE Paris 92

FIGURE 1

# % buoys data received at MEDS

*From January 91 to August 92*



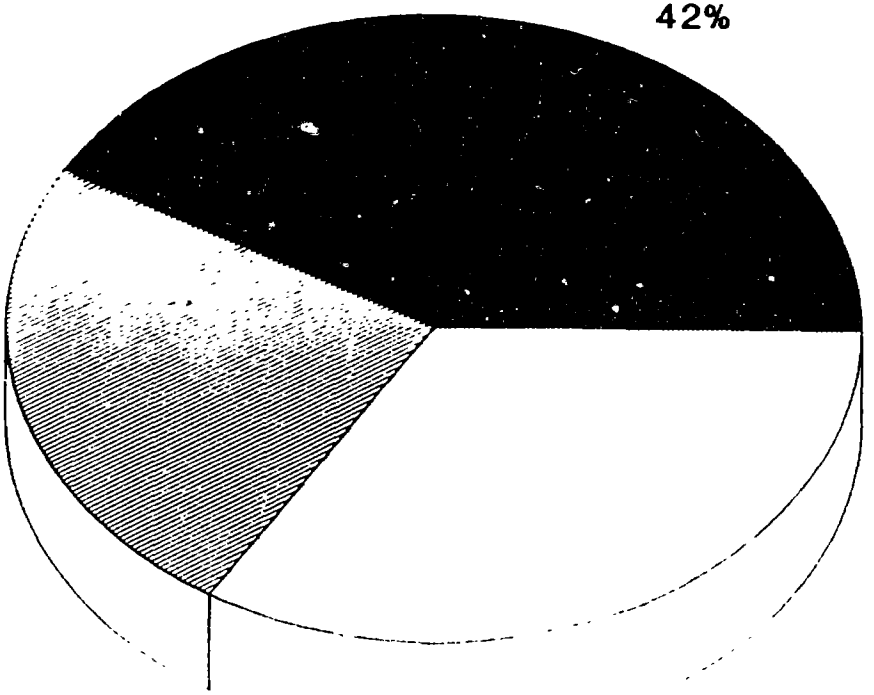

IOC/IODE Paris 92

FIGURE 2

# MEDS Historical Data Base Size

*by Geographical Region*

Total number of messages
5,281,662




IOC/IODE Paris 92

FIGURE 3

## RNODC FOR WESTPAC, ADCP, IGOSS & MARPOLMON - JAPAN

### ACTIVITIES OF RNODC FOR WESTPAC

As of 4 August 1992, the data holdings ar RNODC for WESTPAC sums up to 230 cruises, 45 of them from Korea and 185 from Japan. Amongst the data received, increase of ADCP & CTD data are remarkable for the past intersessional period. Compared to the 1,120 points of ADCP data which RNODC for WESTPAC reported at the IODE-XIII, the present archive is 9,104 points. So is the case of CTD and 1,247 casts increased to 5,884 casts. In return, there has been received no GEK data for the past intersessional period. Other than ADCP & CTD data, XBTs and bottled data are received at steadv pace.

### ACTIVITIES OF RNODC FOR IGOSS

As the activities for the RNODC for IGOSS, JODC participated in the GTSPP meeting during the past intersessional period. The semi-annual report has been sent to WDC-A & B, IOC, & WMO. Japanese contribution to GTSPP is made from the Meteorological Agency from Japan (JMA), one of the IGOSS SOC, by sending IGOSS data monthly since April 1992.

### ACTIVITIES OF RNODC FOR MARPOLMON

The activity as the RNODC for MARPOLMON at JODC is slow, as there has been little if none, contact with MARPOLMON activity. JODC, however, collects data at steady pace as the RNODC. Although the source of input is limited in number, such as the Maritime Safety Agency of Japan (JMSA) & JMA, RNODC-MARPOLMON has received 3,524 oil slick data, 375 tar ball data, 280 beach tar data and 130 hydrocarbon data during the past intersessional period, which increased the archives by 3% compared to that at the IODE-XIII.

### ACTIVITIES OF RNODC FOR ADCP

JODC has developed a data management and quality control software for hull-mount Acoustic Doppler Current Profiler data during the past intersessional period. The software works on UNIX environment, and allows users to control the quality of data, either manually or automatically, display current vector along with bathymetry, average surface current velocity or temperature of surface, 50 meter, 100 meter, or 2000 meter layer, obtain statistics and display as graphs for any given area, and many more. The software is now being used at JODC on experimental basis for improvement of functions and flexibility for various types of instruments and format. In this context, questionnaire is being sent to various institutes. After the completion of the software, which is expected to be early next year, it will be distributed from JODC as a part of the activities of RNODC for ADCP, for free of charge.

## REPORT ON THE ACTIVITY OF RNODC IGOSS AND RNODC MEDALPEX, RUSSIAN FEDERATION

Oceanographic Data Centre (ODC) of All-Russian Research Institute (RIHMI-WDC) of Hydrometeorological Infomation (Obninsk) operates as RNODC IGOSS since 1984 and performs the functions of acquisition of BATHY, TESAC and DRIBU data, made available via the GTS channels, their preprocessing and control, formation of IGOSS data set and servicing the users with information on data, copies of data and the results of their processing.

RIHMI-WDC receives data from the World Meteorological Centre in Moscow via the GTS channels. In December 1991 Intercomparison of data flows received in Obninsk was made similar to those, organized by WMO 2-3 October, 1989 for the six World Centres. The task was to determine the completeness of data flows received by RNODC IGOSS. The analysis of the results suggested that data flows in WMS, Moscow, and the differences in statistic references are attributed to the fact, that these references are made at different steps of the reports processing and both the duplicates and results of data quality control are considered in their own way. Due to this, amount of the received reports in WMC, Moscow is somewhat larger in contrast with the reports RNODC IGOSS. Studying the results of quality control of data, made available via the GTS, detected, that, as before, some loss of information take place on account of errors in attributing part (up to 20%), which makes difficult the identification of the reports and data proper (up to 10%). Recently the loss of information was attributed to the change of codes in DRIBU reports.

Under the process of decoding, the reports, made available to RIHMI-WDC via the GTS, are checked for parameter values, limits and other control procedures also take place in accordance with IOC/WMO recommendations for IGOSS. The suspect values are not eliminated but assigned the corresponding quality control sign. The duplicates are removed and the reports are arranged chronologically. The data are accumulated on magnetic tape during a month and then they are converted to the archival format and

incorporated into the set of quasi-operational data CYCLON. At the same time the data of the set received in BATHY,TESAC and DRIBU reports are isolated and arranged as a set of RNODC IGOSS. The IGOSS set is also monthly accession and chronologically ordered. Thus, the formed data set on IGOSS is ready for international exchange and meeting the users' requests. But the users can be served at more earlier steps of the set formation when an issue of data presentation format is coordinated. Monthly data amounts are processed using special programs for obtaining statistic references on accessioning the reports for the previous month (amount for types, days of month, ship call signs). Since 1992 RNODC IGOSS produces maps of distribution of reports for the World ocean area via PC computer facilities.

Information base of data for drawing maps for the whole history of RNODC hac been prepared. Maps with other statistic references will be regularly sent to the WMO. In 1990-1992 the IGOSS data set was replenished with 1941 reports. To have an idea of the rate of accessioning the set one can use the following table:

| | 1984-1989 | 1990 | 1991 | 1992 | Total |
|---|---|---|---|---|---|
| BATHY | 266 674 | 15 700 | 15 567 | 9 292 | 307 243 |
| TESAC | 60 443 | 5 912 | 1 876 | 1 050 | 69 281 |
| DRIBY | 55 616 | 51 286 | 103 740 | * | 210 643 |
| Total: | 382 734 | 72 898 | 121 183 | | 576 815 |

* The amount will be known after the reports are converted into the new codes.

RNODC IGOSS receives data from 15-20 countries with some variations in months. The Table, given below,shows the amount of reports for 1990-92 received with call signs not identified and reports from ships of the former USSR as well as total amount of reports from all foreign ships with respect to the former USSR.

| | BATHY | TESAC | DRIBU |
|---|---|---|---|
| Ships not identified | 11570 | 160 | - |
| Soviet | 4800 | 6126 | |
| Foreign | 24189 | 2512 | 155025 |

The set of RNODC IGOSS is used in RIHMI-WDC for formation of the Global set of oceanographic data in the interests of GTSPP project (Global Temperature-Salinity Pilot project). According to Recommendation 6 of V Meeting of Joint Working Committee on IGOSS, held in 1990-1992, (JWC-IGOSS-V, Rec.6) RNODC IGOSS transmitted sea-level data for the international exchange: monthly means of sea-level height were hourly transmitted for two stations (Petropavlovsk-Kamchatsky and Juzhno-Kurilsk) to Honolulu and monthly means of sea-level height, obtained at 8 hydrometeorological stations, were transmitted to PSMSL for 1991. The request for data from GB was met concerning hourly sea- level observations for 1977-1990 and atmospheric pressure for 1977-1985 for hydrometeorological station "Bukhta Provideniya". During the intersessional period RNODC MEDALPEX went on working, but no new data have been submitted to RNODC.

## RNODC FOR IGOSS - USA

The US National Oceanographic Data Center (NODC) serves as a Responsible National Oceanographic Data Center (RNODC) for data generated from Member States participating in the Integrated Global Ocean Services System (IGOSS). The RNODC collects near real-time subsurface temperature and salinity IGOSS message data, and assists the collocated World Data Center A, Oceanography in providing data services from the IGOSS dataset.

Near real-time data are gathered each day at NODC from the Ocean Products Center at Camp Springs, Maryland and the Ocean Applications Group in Monterey, California. These data are channeled to the Marine Environmental Data Service (MEDS) in Canada, who quality control the data for the Global Temperature-Salinity Pilot Project (GTSPP) then return the data to NODC. At NODC, IGOSS data are stored in the GTSPP Continuously Managed Database (CMD), from which they are retrieved for requestors.

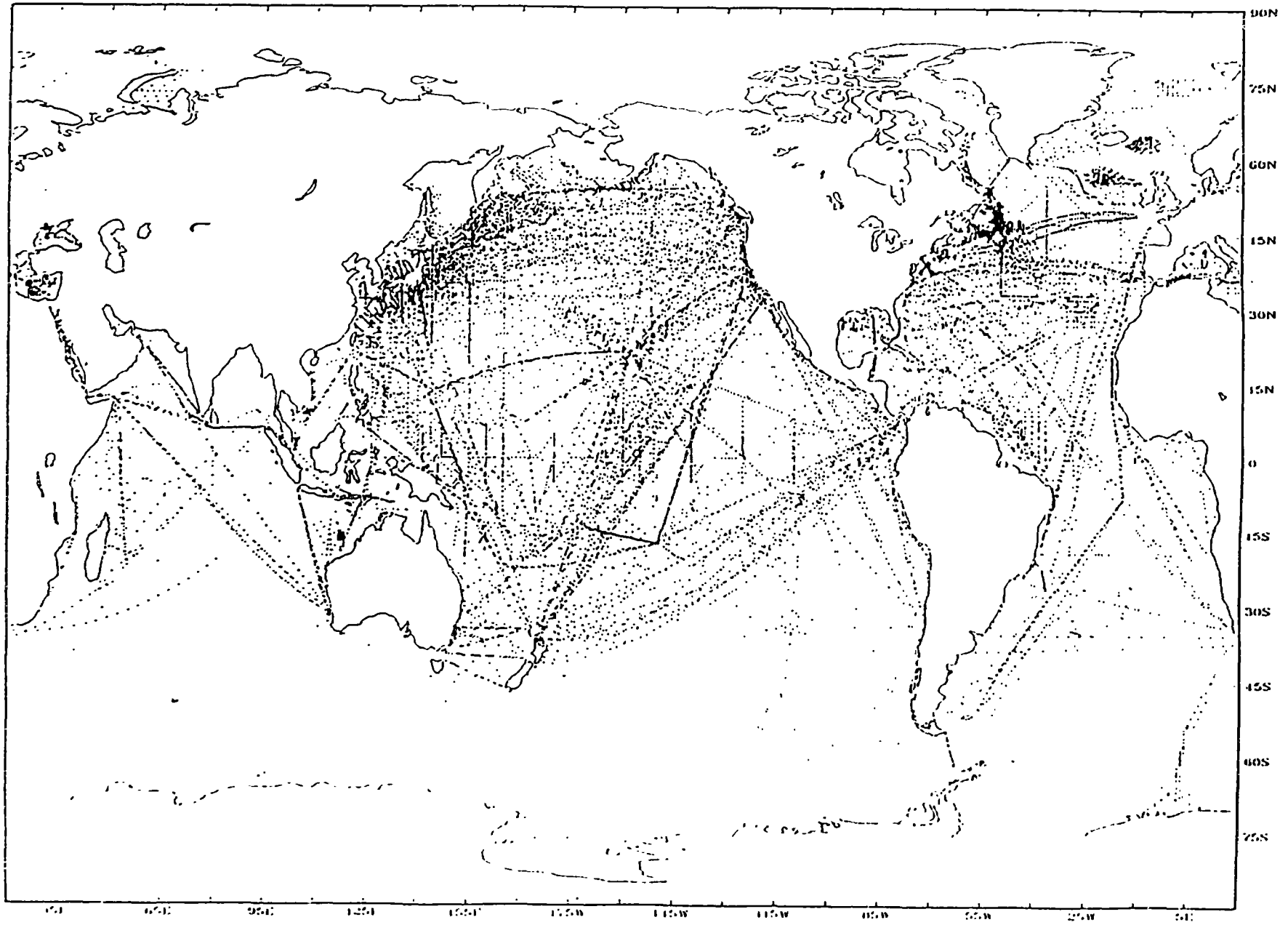
The numbers of observations received for recent years are as follows:

| 1991 | 1990 | 1989 | 1988 | 1987 | 1986 |
|---|---|---|---|---|---|
| 39,077 | 33,906 | 35,160 | 35,540 | 44,687 | 20,305 |

NODC continues its cooperation with Scripps Institution of Oceanography, through the Joint Environmental Data Analysis (JEDA) Center, in support of the Tropical Ocean - Global Atmosphere (TOGA) program. NODC merges IGOSS real-time data with delayed mode data to create a TOGA Pacific Ocean data set which is used by SIO to generate bi-monthly products. In return, Scripps adds quality flags to the data, which are incorporated into the TOGA database, based on their scientific analyses. The quality controlled data set is then distributed by NODC to the TOGA Sub-Surface Data Center in Brest, and in turn a copy of these data are provided to WDC-A, Oceanography in the GF3 format.

The above concept has been expanded by the Global Temperature-Salinity Pilot Project (GTSPP) to include data from around the globe. Therefore, IGOSS data are now distributed each month through GTSPP to regional science centers for the Pacific (Scripps Institution of Oceanography, La Jolla), Atlantic (Atlantic Oceanographic & Meteorological Laboratory, Miami), and Indian (Commonwealth Scientific & Industrial Research Organization, Hobart) Oceans. These centers are Upper Ocean Thermal Data Assembly Centers for the World Ocean Circulation Experiment (WOCE). As such, they use the data for scientific analyses, and return quality flags to NODC, where value added information is merged into the GTSPP database.

IGOSS 1991 BATHY and TESAC data (39,077 messages) at U.S. NODC



## RNODC FORMATS - INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

### 1. Oceanographic Profile Data

In the intercessional period, the data centre has consolidated its remit as a centre for oceanographic profile data for use primarily by scientists in its member countries. These include the North America and the countries of northern Europe and the western Mediterranean. The Centre is acquiring approximately 20,000 new stations each year, all of which are quality-controlled and scientifically judged. Only a very small percentage of these data are submitted in accordance with IODE-guidelines, and most are received direct from scientists rather than via IODE National Data Centres/Designated National Agencies. In some, but not all, cases the National Data Centre has asked ICES to pass data onto the World Data Centres but so far has not been able to do so because of lack of resources and commitment. In addition to National data submissions, the data centre has been providing a hub for various international projects, such as NANSEN, the Greenland Sea Project, the North Sea Task Force, and SKAGEX (Skagerrak Experiment). As well as providing standard data centre services, in some cases scientific evaluations of the data have been made.

### 2. RNODC-Formats

As RNODC-Formats, ICES has maintained its commitment to disseminating GF3 publications to the user-community. Approximately 200 requests have been received for this literature. Furthermore ICES has widely disseminated the new Cruise Summary Report (ROSCOP III). To date no improvement in the use of ROSCOP has been detected following the introduction of this form by IODE in 1990, and many difficulties have arisen partly because the form-fillers do not have access to the new code lists. This has led to an increase in work by ICES in converting this information to ICES's PC-based Roscop search-utility, ROSEARCH, which is accompanied by a ROSCOP-III form entry utility (ROSIN). ICES is assisting WDC-A in digitising those ROSCOP forms not already in the ICES system. Once completed, about 22,000 cruises will be digitized, and searchable using ROSEARCH.

At GETADE-V, the terms of reference of RNODC-Formats were revised to reflect changing priorities in data exchange. A major function will be continuing assistance to GETADE in the maintenance of various code lists used for data exchange purposes.

### 3. Consideration of new data types.

Following discussion at IODE XIII, The ICES Working Group on Marine Data Management has been designing guidelines for the handling of ship-borne ADCP and sea-soar type data. Details of the progress made so far are given in the 1992 report of the Working Group, copies of which will be available at IODE-IV. The production of guidelines is still very much in its infancy, and the working group is not yet in a position to make firm proposals. These proposals are likely to hinge on the need

for collecting institutes to conform to certain principles when archiving data within the institute as it considers that centralized storage is not yet either desirable or practical.

**4. Future strategy for working of ICES Oceanographic Data Centre.**

The data centre currently operates from a platform that is commensurate with the manpower and other resources at its disposal. Its oceanographic data bank, which currently consists of ca 500,000 CTD and hydro-chemistry profiles is currently maintained as a continuously managed data base using bespoke PC-based software. Up to 1960 there is close overlap with the data held at WDC-A, but after this date ICES holds a large amount of data unique to it. Much of this software has been adapted for use in the prototype version of IOC's Ocean-PC. As with Ocean-PC however, it is ICES's intention to abandon the now old-fashioned ICES 'punch card' format and develop a new, extensible, format for its archive structure. It is planned that ICES data management and QC software will be supported on Unix, DOS, and Macintosh. A need to commit the data bank to a commercial database management system has not been recognized. A major part of the strategy will be to provide systems which customers can use, thus allowing for a greater potential spread of the workload. Likewise, ICES will encourage the import of its data sets to other systems, especially those concerned with product presentation. One such example is the incorporation of a 22 year time series of an ICES's project hydro-chemistry data set into UKDMA developed by the UK data centre (BODC).

# NATIONAL REPORT OF ARGENTINA

**Argentinian Oceanographic Data Centre (CEADO)**
**Activities Report (1990-1992)**

1. Data acquisition and processing

During the intersessional period the following types and quantities of data were acquired and processed: physical and chemical data from the area of responsibility, corresponding to 213 oceanographic cruises, bathytermograph data corresponding to 32 oceanographic and non-oceanographic cruises carried out in areas of the South Atlantic, surface data on temperature and environment corresponding to observations performed in six fixed coastal stations between 1989 and 1992. Besides, supporting the IGOSS program, a new data base was implemented with the input of data from 2,600 BATHY messages and 385 TESAC messages, obtained in the period 1975-1992.

2. Data and information exchange

During the intersessional period, CEADO performed the following foreign exchange:

- National Oceanographic Programmes correspoding to 1990,1991 and 1992 were forwarded to IOC's Secretariat.

- Twenty six ROSCOP's (CSR) forms corresponding to oceanographic cruises carried out by Argentine vessels; magnetic tapes with physical and chemical data corresponding to 4 cruises carried out in the Southwestern Atlantic and 22 cruises performed in the Southern Oceans; and bathytermograph observations corresponding to 32 oceanographic and non-oceanographic cruises carried out in the Southwestern Atlantic were sent to the World Oceanographic Data Centers. Also, 2 updates to Data Catalogue, Volumes I and II, were sent to the World Centers.

- Information corresponding to the databases developed by CEADO were annually sent to the Coordinating Center on MEDI (IOC - Unesco).

Data and information exchange was also performed with oceanographic Institutions and national Universities, and with the following international organisms: World Centers, National Oceanographic Data Centers of Brazil, Chile, Ecuador, Germany, Japan, Russian Federation, and Uruguay; Texas University, Woods Hole Oceanographic Institution, Alfred Wegener Institut für Polar Research, Marine Geology and Geophysics Branch of Boulder, Colorado, etc.

3. Technological developments

3.1 Software

During the intersessional period, systems for database input, quality control, and consultation by means of microcomputers were developed and implemented for the following types: bathytermograph data, referential information, coastal stations data, and BATHY, TESAC and TRACKOB messages.
In order to adjust the systems to the new equipment, an integral system of automatic plotting of data products was developed, by using high and low resolution plotters.
Also, in this period, programs corresponding to the software package of the OCEAN-PC, implemented by diverse sources for the processing and analysis of marine data, were entered into the Operative System directory of CEADO.

3.2 Hardware

During 1990 and 1991, four microcomputers, two automatic plotters, one printer, and a CDROM drive unit, were acqired by CEADO. The latter, permitted the access to data stored in this new format, that are periodically received from several sources, as NODC/NOAA, NASA (Goddard Space Flight Center), and the U.S.A. Ice Data Center.

In 1992, a linking net among CEADO's workstations was implemented.

4. Regional responsibility

- In August 1987, CEADO was accredited to operate as Responsible National Oceanographic Data Center for the Southern Oceans (RNODC/SOC) by IOC's Secretariat. The corresponding activities report being submitted under separate cover.

- In June 1990, CEADO was accredited to operate as Specialized Oceanographic Center with responsibility in the South Atlantic within the Integrated Global Oceanographic Services System (IGOSS), by IOC s Secretariat and by the World Meteorological Organization (WMO).

5. Training and technical assistance

- In May 1991, with the support of IOC, a training course in oceanographic data exchange and processing was carried out , at a regional level, with participation of 3 representatives of the National Oceanographic Data Centers of Brazil (2) and Chile (1).

- In fulfillement of the agreement between the Governments of Germany and Argentina in the area of Ocean Sciences, a transference of technologies and methods to be applied within the IODE system (Project M2) is being carried out since 1989. Within the scope of the agreement, during May and June 1991, the visit was received of a member of the German Oceanographic Data Center (DOD).

- In September 1991, the visit was received of the Director of the Oceanographic Data Center of Uruguay, interested in knowing the activities performed at CEADO and willing to increase exchange, and technology transfer between both Centers.

- In October 1991, by invitation of IOC, one of the scientific computer technicians of CEADO participated, as instructor, in a course taking place in Bogota (Colombia), where attendants were instructed in the use of microcomputers in the support of oceanographic data processing. This course was attended by representatives of the National Oceanographic Data Centers from 5 countries of the Caribbean area (IOCARIBE).

- In July 1992, with the support of the German Government and the Secretariat for Science and Technology of Argentina, and within the scope of the M2 Project, one of the scientific computer technicians of CEADO took a training course on pollution data procesing at DOD.

6. International events

In February 1992, as a member of RNODC's Group of Experts and Climate Data Services, the Director of CEADO attended the Second Meeting of that Group in NOAA headquarters, Washington D.C., and the Workshop on Ocean Climate Data, that was previously held at NASA's Goddard Space Center.

Publications

The following documents were published:

- CEADO Annual Reports 1989 - 1990 - 1991
- RNODC-SOC Annual Reports 1990 - 1991
- Annual Updates to the Data Catalogue (Volumes I and II).

# Australian National Report

## Australian Oceanographic Data Centre

### Introduction

Australia is continuing to support IODE and the associated programs such as GTSPP. Since the previous IODE Committee Meeting the AODC has been working on the development and installation of a large oceanographic data management computer system. This system is presently undergoing final acceptance testing and is anticipated to be operational in March 1993. The introduction of this system will significantly increase Australia's ability to contribute to the international exchange of oceanographic data. A number of other initiatives are also underway.

### RAN Oceanographic Program

Approval has been given by Navy to the concept of developing a major oceanographic survey program with the aim of better understanding the water masses in the Australian region. The program incorporates the collection of data through a systematic survey of the region using defence vessels, leased oceanographic ships, aircraft and satellite imagery. A major aspect of the data acquisition project is the continued contribution to the international marine science community including IODE for data exchange and WOCE for data collection and processing.

### HMAS Moresby

As a start to implementing the oceanographic program the RAN Hydrographic Survey Ship HMAS MORESBY is being used to provide a limited oceanographic capability for three month periods each year for the next five years. The initial cruise will commence in April, 1993 and will collect water column data using XBTs, CTDs and an Acoustic Doppler Current Profiler. The data will be processed by AODC and made available to the international community. The survey area will be within the Australian EEZ and in northern waters.

## Regional Cooperation

To support the data survey program, it is intended that support will be given to the regional efforts of other countries through various cooperative projects. This is already beginning with the RAN providing advice and training to the Royal Malaysian Navy in the areas of oceanographic data collection and data management. Malaysia intends to create a national oceanographic data centre and contribute to the appropriate IOC programs particularly IODE. The AODC has assisted in the planning phases of this and will also be assisting with implementation and training aspects. This is also an opportunity for the data archaeology projects and have already begun in Malaysia to recover historical data.

## Satellite Capability

In the first few months of 1993, the AODC will be implementing a remote sensing capability. NOAA AVHRR data will be processed to provide both seven day weighted average SST and water clarity images. The imagery will be available in near to real time and will be archived and integrated into the oceanographic data management system together with in-situ observations.

The image management facility will allow the development of statistically derived information products such as monthly and seasonal averages of SST and turbidity for the Australian region..

## Modelling

An ocean basin scale dynamic modelling capability will also be implemented at AODC in 1993. This model will take near real time in situ data and incorporate the data developed from the SST imagery and generate 3 dimensional temperature and current fields. The model will meet a number of purposes including identifying spacial and temporal gaps in the data collection program. Various products derived from the model will be made available.

## International Data Exchange

The AODC continues to provide data into the IODE system, predominantly via NODC in Washington.

## Data Sent to WDC-A since 1 January, 1991

5000 RAN XBT traces
951 Franklin (CSIRO) XBT Traces

1532 Franklin CTD (CSIRO) samples
812 Sprightly CTD (CSIRO) samples

We presently hold almost 16,000 XBTs, 3500 CTDs and 1200 secchi disk observations from Navy, CSIRO and New Zealand sources which will be forwarded to WDC-A early in 1993.

## Communications

The AODC has significantly improved its communications capabilities. We are now linked to the Australian Academic Research Network which has access to INTERNET. Through this network we are able to communicate both mail and data. AODC is already accessing NODC to acquire monthly GTSPP data sets. It is probable that in the near future most data exchanges will take place through this network.

## HydroComp

As mentioned previously the AODC is presently undertaking final acceptance testing of the oceanographic data management computer system known as HydroComp. This system has been designed around a commercial Geographic Information System package which uses the ORACLE Relational Data Base Management System as its main component. The AODC spent several years designing the system to provide three main functions.

The first is data management and the system will archive data in the form provided by the originator. A second data base will be used for operational work and will consist of quality controlled data sets.

The second component of the system consists of analysis tools which provides the capability to create virtual data such as sound velocity profiles from temperature and salinity observations. It will provide the ability to merge different data sets.

The third component of HydroComp is data visualisation capabilities. HydroComp will use a range of techniques to display data, including digital terrain models to provide 3D and 4D representations of system outputs. Any parameter can be used to create a surface and other parameters including satellite imagery can be draped over that surface.

While the system is initially limited in the types of data that can be managed, part of the design philosophy was to provide a set of tools so that further development would be relatively simple. New data types such as ADCP and current meters will be added shortly. An existing data base of sea floor composition data will be added to HydroComp early next year.

The HydroComp software will become commercially available next year.

## CSIRO

The CSIRO continue to operate the national research facility RV FRANKLIN. Data collected by Franklin is forwarded to the AODC for archiving. The CSIRO SOOP also provides a considerable quantity of data via WOCE. AODC is providing assistance in this activity by providing over 2000 XBTs per year and assisting with the quality control of the high resolution data.

## HOMA Data Management Policy

The Head of Marine Agencies is in the process of forming a Task Team to look at the development of a national policy for the management of marine data. It is likely that this task team will use a similar approach to that adopted by the US National Oceanic and Atmospheric Administration (NOAA) to effectively safeguard data collected through public funding. The provision of funding will be conditional on the data being made available to the appropriate national agency for archiving. The introduction of such a policy will significantly increase the quantity of data that could be made available for international exchange.

# NATIONAL REPORT OF BRAZIL

## Report on Intersessional Activities of the Brazillian Oceanographic Data Centre (BNDO)

The Brazilian Oceanographic Data Center (BNDO) was established at the Directorate of Hydrography and Navigation (DHN) with the objective to coordinate and integrate oceanographic data exchange within the country, as well as to serve as the national documentation centre and liaison office to the Committee on International Data and Information Exchange (IODE) of IOC.

The major activities of BNDO relates to archiving, processing, quality control and disseminating oceanographic data obtained in Brazilian jurisdictional waters.

Since the XIII Session of the IOC Committee on IODE a number of advances have been made in Brazil, concerning oceanographic data exchange. These changes and various initiatives in data acquisition, management and exchange are described below:

### 1) Acquisition of a VAX 6510 System

As a result of a very comprehensive study to redefine the data management strategy in Brasil, that was completed in June 1992, the Department for BNDO is in the process of substituting a MICROVAX-3400 computer by a VAX 6510 one, with 8.0 Gbytes of disk storage and a full complement of peripherals linked to a main network, including personal computers, printers, terminals, routers etc. that will lead to the establishment of a relational database management system in the near future. It is believed that this new system will greatly implement the acquisition and cataloguing of a wide range of data from many sources within Brazil. Additionally, the VAX 6510 system will allow the Brazilian NODC to establish a DECnet network between

DHN and many scientific institutions in Brazil, improving the access to ocean data within the country.

All of the already existing seven systems in BNDO (Oceanography, XBT, Tides, Geology, Geophysics, Meteorology and Currents) will be transferred to the new database during the next intersessional period.

2) Development of data entry modules

Due to an improvement on climatological data acquisition, a module for entering and archiving SHIP and SYNOP data registers has been developed for personal computer users, with ample distribution within the country.

3) Development of a biological database

As a result of a closer cooperation with institutions dedicated to Biological Oceanography research, extensive work has been coordinated by BNDO towards the implementation of a biological database, with amphasis to biomass, chlorophyll, marine ecology and taxonomic standardized data.

It is hoped that further collaboration to this important task will be achieved, during the XIV IODE Session.

4) Increases in data acquisition

The capability of BNDO to acquire data will be greatly enhanced by the new VAX 6510 computer system. This will result on a closer liaison with the research community and consequently on an increase in the process of obtaining delayed mode and historical data, that have not previously been available. As those data sets will be received, they will be made available to the international community, via IODE World Data Centers.

It is worth mentioning that the Brazilian NODC will

hold a significant amount of oceanographic data and information, still to be archived, as soon as the new computational system will be operating.

**5) International Data and Information Exchange**

According to IODE Recommendations, the Brazilian Oceanographic Data Department has submitted all data sets that are presently archived in the Microvax-3400 system to World Data Centers A and B.

During the past intersessional period, 10 ROSCOP forms have been sent to WDC-A and B as well, followed by their corresponding data sets.

According to IHO Technical Resolutions G-4 and G-6, tidal predictions to Brazilian ports were sent to Argentina, United Kingdom and the United States of America, for the years 1990, 1991 and 1992.

All SHIP data registers obtained for Brazilian waters were sent to the German Marine Meteorology Centre during the intersessional period.

Although it has been officially noted by IOC Secretariat that most countries do not regularly send their National Oceanographic Programmes (NOP), Brazil has submitted its NOPs each year of the past intersessional period.

**6) Products and Services**

6.1) Data Inventories

The increased acquisition of delayed mode data has enabled BNDO to expand the existing services and products. The production of data inventories, including data distribution densities on a geographical and, in a few cases, temporal basis, is being carried out, for all data sets archived in BNDO. Such

inventories have already been produced for the oceanographic data set and will soon incorporate geological and meteorological information as well.

6.2) BNDO User's Guide

The updated version of the BNDO User's Guide is currently under edition and will be published by the end of 1992. The Guide has proven to be quite useful for research institutions and private companies that require our services on a regular basis.

6.3) BNDO Bulletin

The BNDO Bulletin was firstly edited in 1991 and has been published twice a year, providing users with updated information, newly-received data sets and major developments in data management. Three issues have already been published and the next one is expected to be out by the end of December.

7) Training of Personnel

With the redefinition of the Brazilian data management procedures and the implementation of a VAX/RDB system, a strong effort on personnel training has commenced during 1991 and is still under way. Training courses have focused on SQL, RDB Administration, among many other subjects, and have been conducted by Digital Equipment teaching staff.

A short-term training course on GF3-Proc, held in Argentina, during the period 06-17 May 1992, has been attended by two BNDO computer specialists. The training course has provided an unique opportunity for IODE South-American countries to exchange ideas on that subject.

It is hoped that the future developments of the IODE Training Programme will be discussed during the forthcoming XIV Session of IODE.

# NATIONAL REPORT OF CANADA

## Report on Intersessional Activities in Canada

The major activities in Canada during the past intersessional period have been related primarily to:

(i) the development and the implementation of the GTSPP;

(ii) the implementation of a management system for Drifting Buoy data as part of the RNODC activity;

(iii) the participation of MEDS in WOCE with two major activities related to Upper Ocean Thermal (UOT) project and the Surface Velocity Program (SVP);

(iv) the continuation of the development of an ocean information network as a joint government-industry-university project to provide improved access to ocean data and information, and foster a stronger private sector value-added industry for commercial use of ocean data and information; and

(v) the acquisition and archiving of satellite data.

### Global Temperature-Salinity Pilot Project

In support of the Upper Ocean Thermal program, each day MEDS evaluates BATHY and TESAC data quality and resolves duplications for the real-time data using specialized software developed in-house for this purpose. The data are updated to MEDS archives three times each week. Data are available to user's at any time based on any retrieval combinations of cruise identification, area and time.

Through MEDS participation in the GTSPP, data are forwarded through an electronic network to the U.S. NODC in Washington three times a week. They, in turn, accumulate the data over the course of a month and then create and forward data files to Scripps and AOML in the U.S. and CSIRO in Australia. These three sites perform scientific quality control and then the data are returned to the NODC.

MEDS has worked closely with the U.S. NODC to coordinate the activities of GTSPP and will continue to do so in the future. The data quality and duplicates management software were installed at the NODC so that data can be handled in a consistent way at both archive sites. MEDS is continuing developing software to improve the detection of duplicate cruises and stations.

MEDS will continue to issue monthly reports of data received from the GTS up to December 1991. Starting with the 1992 data, MEDS

will produce three quarterly reports with data analyses somewhat different than the analyses presented previously. This new type of analysis will make more use of graphics and will generally summarize total data receipts. MEDS will also continue to work with GTS centres to improve the reliability of the communications. At the same time MEDS is in the process of developing, in cooperation with the WOCE IPO, a report of the numbers of stations collected along WOCE sections. MEDS is also working with the Volunteer Observing Ship managers in the U.S. to produce a data quality report for each ship on a monthly basis.

## Drifting Buoy Data

MEDS has completed the development and installation of a small computer system for archiving and retrieving information about the operators of Drifting Buoys as well as the program under which the drifting buoys have been deployed. Other information, such as the characteristics of the buoys are kept when available. This information is provided to MEDS on a monthly basis by Service ARGOS and our files are updated on the same schedule. This system has enabled MEDS to manage effectively the confidentiality of the WOCE drifting buoy data.

MEDS has developed an archiving mechanism for the Drifting Buoys Bulletin Board messages appearing each day on ScienceNet. For a particular buoy or a set of buoys and for a particular time frame, all messages (if any) regarding its operational behaviour are available upon request on paper or computer diskette.

MEDS issue each year an annual report summarizing the data received and processed during the previous year and showing the locations of the buoys. Every month, global maps continue to be issued displaying where the buoys are that report over the GTS. In addition MEDS will also deliver data for a user specified area, time and range of buoys on computer magnetic tape in GF-3 format. Displays of buoy tracks can also be made for any ocean area and time frame. Lately, MEDS is contributing to the IGOSS Products Bulletin (IOC/WMO publication published by METEO France) by providing each month a map showing the month's movement of operational drift from buoys reporting their data onto the GTS.

## Word Ocean Circulation Experiment

### A: Upper Ocean Thermal (UOT)

MEDS continues to receive BATHY and TESAC data flowing daily on the GTS. Table 1 presents the number of messages received and processed over the last 24 months while Figure 1 illustrates the continuing scarcity of salinity data being reported in real-time. Total data volumes are increased over the last 24 months compared

to previous years. Starting in November 1990, the numbers shown in Table 1 and Figure 1 represent the total numbers of BATHY and TESAC received by MEDS, FNOC (US Fleet Numerical Oceanography Center) and NWS (US National Weather Service) as part of the GTSPP. MEDS is now receiving IGOSS data (delayed by one month) from Germany and Japan. The data contained in these data sets not received from other sources is being incorporated into the routine processing and archiving system.

Table 1: Monthly statistics on number of Bathy and number of Tesac received at MEDS

| Month/ Year | # of Bathy's | # of Tesac's | Month/ Year | # of Bathy's | # of Tesac's |
|---|---|---|---|---|---|
| Aug 90 | 2206 | 477 | Aug 91 | 2562 | 139 |
| Sep 90 | 2018 | 503 | Sep 91 | 2999 | 249 |
| Oct 90 | 1894 | 421 | Oct 91 | 2598 | 192 |
| Nov 90 | 2676 | 182 | Nov 91 | 4524 | 376 |
| Dec 90 | 2168 | 243 | Dec 91 | 4052 | 133 |
| Jan 91 | 2596 | 259 | Jan 92 | 3414 | 30 |
| Feb 91 | 2888 | 201 | Feb 92 | 4541 | 103 |
| Mar 91 | 2789 | 157 | Mar 92 | 3969 | 212 |
| Apr 91 | 2606 | 441 | Apr 92 | 3897 | 146 |
| May 91 | 2962 | 446 | May 92 | 3592 | 305 |
| Jun 91 | 2881 | 202 | Jun 92 | 3693 | 303 |
| Jul 91 | 2737 | 88 | Jul 92 | 3890 | 91 |

B: Surface Velocity Program (SVP)

MEDS continued to receive Drifting Buoy data flowing daily on the GTS. Table 2 provides the number of buoys for which MEDS is receiving data on the GTS and the total number of messages received monthly during the last intersessional period. It also provides the number of operational buoys for which MEDS is receiving the data. The growth in data volume is illustrated by Figure 2 where it can be seen that the number of Drifting Buoys reporting data onto the GTS is increasing while the number of messages received at MEDS has also increased particularly since the middle of last year.

As part of the Data Management Plan for WOCE projects on Drifting Buoys, MEDS has also received from the Atlantic

Oceanographic and Meteorological Laboratory (AOML) Drifting Buoy data for the 1985-1990 period. This data was processed and archived by MEDS and later sent to the Jet Propulsion Laboratory for inclusion in the latest CD-ROM being prepared for TOGA.

Following a recommendation made by the Data Management Committee on WOCE, MEDS has also recently received Drifting Buoy data from AOML for a 6-month period (July to December 1991). This latest submission is the first one being done under the auspices of the Data Management Committee.

MEDS is now presently developing an enhanced computer archiving system to handle the new kind of SVP data received from AOML in order to provide the users complete sets of drifting buoy data as received in the final archive.

Table 2: Monthly statistics on number of buoys and number of messages received at MEDS

| Month/ Year | # Messages received | # Buoys repor- ting | Month/ Year | # Messages received | # Buoys repor- ting |
|---|---|---|---|---|---|
| Jan 90 | 36518 | 269 | May 91 | 53556 | 326 |
| Feb 90 | 35733 | 271 | Jun 91 | 42927 | 322 |
| Mar 90 | 45564 | 264 | Jul 91 | 42093 | 318 |
| Apr 90 | 45047 | 260 | Aug 91 | 44150 | 347 |
| May 90 | 46359 | 294 | Sep 91 | 48127 | 378 |
| Jun 90 | 46347 | 323 | Oct 91 | 43232 | 423 |
| Jul 90 | 50175 | 317 | Nov 91 | 40923 | 421 |
| Aug 90 | 50247 | 313 | Dec 91 | 47035 | 453 |
| Sep 90 | 45943 | 307 | Jan 92 | 53787 | 473 |
| Oct 90 | 47871 | 321 | Feb 92 | 61099 | 469 |
| Nov 90 | 47438 | 328 | Mar 92 | 64377 | 503 |
| Dec 90 | 49400 | 326 | Apr 92 | 60659 | 479 |
| Jan 91 | 40106 | 347 | May 92 | 66232 | 513 |
| Feb 91 | 45935 | 319 | Jun 92 | 63820 | 542 |
| Mar 91 | 49950 | 328 | Jul 92 | 61904 | 532 |
| Apr 91 | 48281 | 323 | Aug 92 | 52112 | 573 |

## Inland, Coastal and Ocean Information Network

The Inland (waters), Coastal and Ocean Information Network (ICOIN) is a concept that has been under discussion and development in Canada for several years. The concept pictures organizations in government, industry and universities interchanging marine data and information across computer networks. Emphasis is being placed on geo-temporal environmental datasets in disciplines including, inter alia, oceanography, hydrography and limnology. Work has begun building the network.

The federal Department of Fisheries and Oceans is leading the project through its special ICOIN Management Board. The Board is establishing the ICOIN Program Office (IPO) which will help coordinate the project. The IPO has a three-year mandate to bring the growing network to critical mass. It is now developing the tools it will need, including a suite of promotional materials, electronic forums and a computerized directory to the data and information sources becoming available on the network. As network use increases, the IPO will help develop the protocols and standards to expedite interchange. It is projected that ICOIN will eventually have many hundreds of sources available serving a community numbering in the thousands.

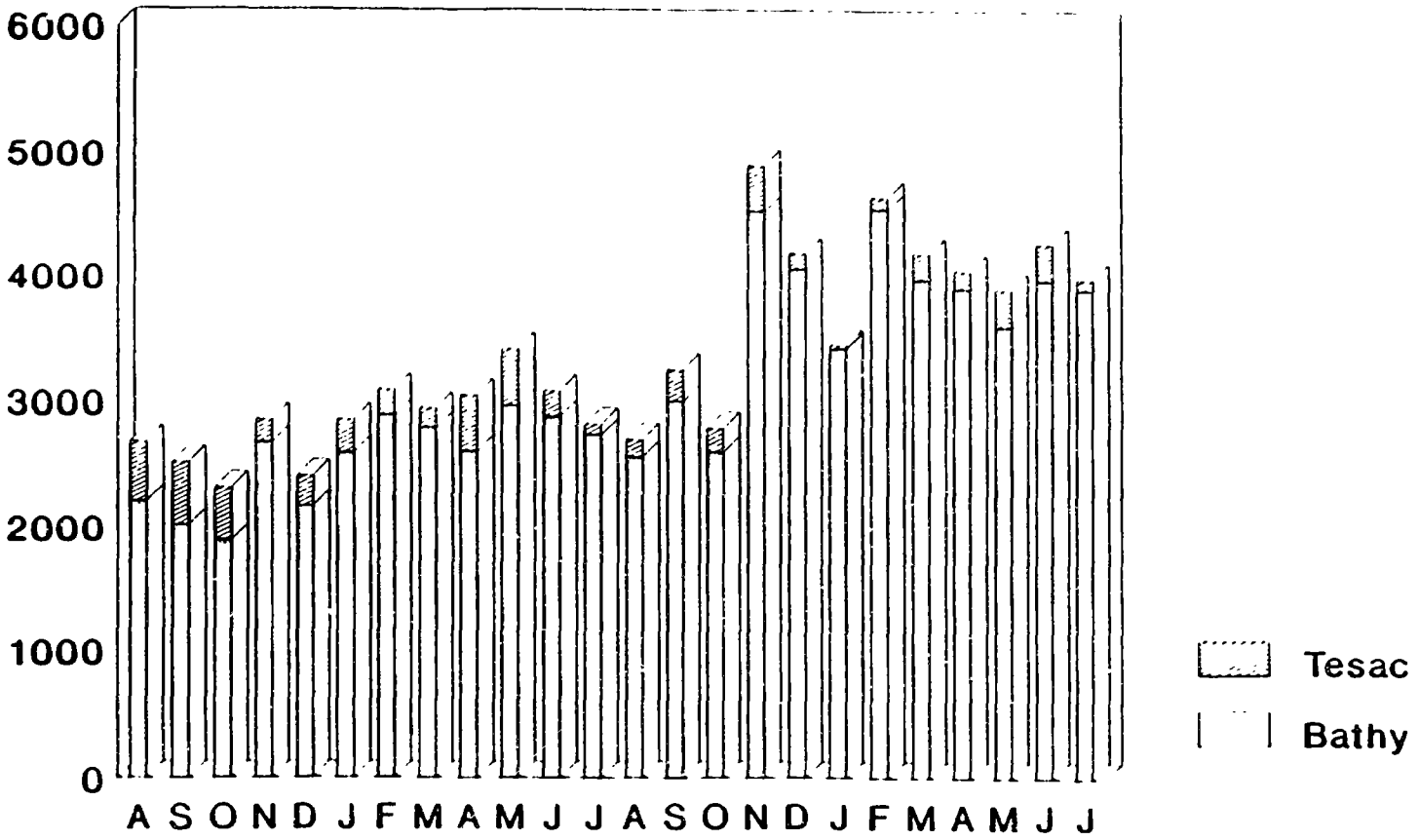
## ERS-1 Satellite data

MEDS has begun to acquire and create archives of certain types of remote sensing data. All of the altimeter data collected by GEOSAT has been acquired by MEDS and copies are made available upon request to users. At present, the archives reside on magnetic tapes.

MEDS has reached an agreement with the European Space Agency to be the provider of the low bit rate data (scatterometer and altimeter) to scientific users within Canada. Since ERS-1 was launched, MEDS has received magnetic tapes of both the fast delivery product and the high precision orbit data. These data are also being maintained on computer magnetic tapes.

# GTSPP Totals Table

*Bathy's & Tesac's (August 90 July 9?)*




IODE XIV Paris 1992

FIGURE 1

# RNODC for Drifting Buoys

*January 1990 - August 1992*

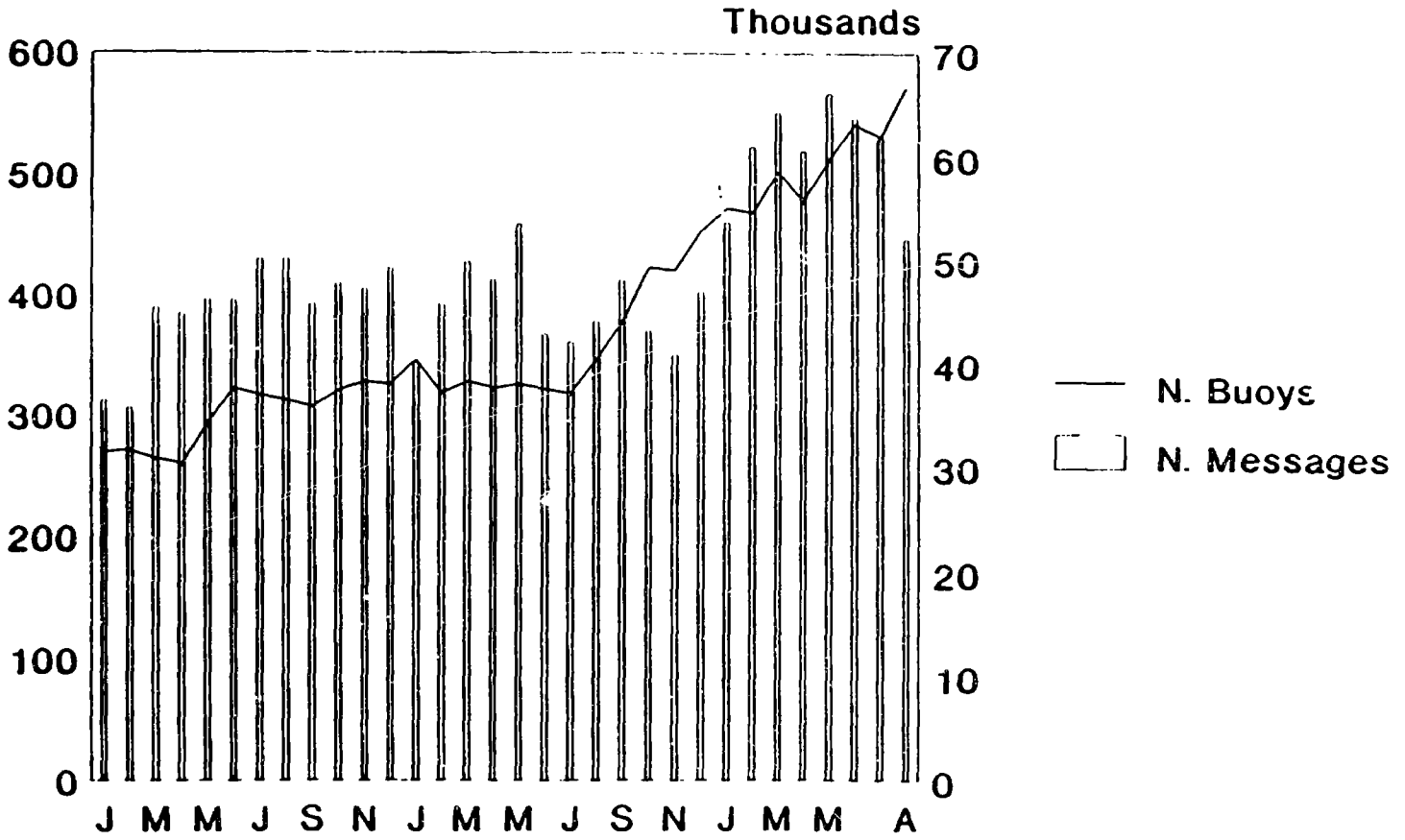



FIGURE 2

# NATIONAL REPORT OF CHILE

## Report of the Intersessional Activities in Chile

The National Oceanographic Data Center (CENDOC), has been actively requesting and collecting oceanographic data from several national organizations which have carried out oceanographic expeditions. Also, great amount of data has been recollected from other national data centers, specially from the U.S. NODC, comprising a wide area of national concern defined as shown in figure Nº 1.

The above mentioned tasks have had, as a goal, on one hand the CENDOC's data base up-dating concerning all the information available all over the country and, on the other hand, the most significant possible data collection so as to make a newer edition of the Oceanographic Atlas of Chile.

Concerning the Global Data Exchange CENDOC has been carrying out certain lack of activity due to a lack of personnel and material resources, which have prevented from the complete fulfillment of duties involved within the IODE System. Its tasks have been restricted, regarding the global data exchange, to accomplish requirements made by national and foreign scientist and scientific institutions, and those related to data for international research programs as WOCE, TOGA, etc.

Nowadays, we are in plans to get funds enough so as to reactivate and strengthen CENDOC'S performance, which in the very near future will be essential because of the imminent oceanographic survey ship's acquisition by the Chilean Navy. This fact, undoubtedly, will mean a CENDOC's great activity dealing with new oceanographic data and information from extensive areas of Eastern Pacific, so far not quite explored.

## II.- PARTICIPATION IN GLOBAL OCEAN SCIENCE PROGRAMMES

Cendoc is an active member of the Chilean Marine Science community, which is coordinated by the National Oceanographic Committee (CONA). Through this committee, Cendoc plays an important centralizing role in collecting data and information obtained under global oceanic science programmes, such as JGOFS, IGOSS, WOCE and TOGA, in which Chile has been taking active part.

In the near future, CENDOC will also have an active participation in GOOS, playing an important role as far as recollection and diffusion of data becoming from the observation platforms; from now on we can assure that our country will do its best to efficiently contribute to the GOOS's goal achievement, including an active participation of the data flood within the system.

## III.- NEW DATA TYPE AND PROCESSING

So far, there are not plans to include new kinds of data to CENDOC to innovate the processing system, though the increasing need of having more agility concerning the data exchange procedures which will be perfectly achieved once CENDOC's activation plans have been implemented.

Notwhistanding, the increasing need to add chemical and biological data (tracers, O2, nutrients, clorophila, pH, alkalinity, etc.) into the Oceanographic Data Base is recognised, due to its significance and support to programmes such as WOCE, JGOFS, Pollution Control and others. The better the impelling work towards an effective reactivation of CENDOC, the better will be the search to incorporate them into the Data Base.

## IV.- DATA PRODUCTS AND SERVICES.

In the latest years, Cendoc's services have become restricted only to serve the national community as far as their data need is concerned.

Regarding products, an oceanographic atlas is in development which has been considered as necessary by the national marine science community, and will cover an important area within the region of the Eastern Pacific.

Likewise, an up-date catalog of data existing in the country has been proposed to be elaborated specifically at Cendoc, in order to facilitate data release to national and international data users.

Within the reactivation plan, the development of several new products has been taken into account, in the form of processed data such as synoptic SST charts, charts of currents, issuing of long time series tide observations, waves, etc.

Our country has actively collaborated upon the Climate Alerting Bulletin's elaboration by means of the timely sending of the TSS and sea level data. Chile also has the responsibility of issuing a monthly bulletin on Regional Climate Warning for the Permanent South Pacific Commission CPPS.

The latter has obliged to have an efficient flow and data exchange among several agencies belonging to those CPPS countries (Chile, Colombia, Ecuador, Perú).

## FINAL REMARKS

Chilean NODC is experiencing a lowering in its activity level, due to budgetary restrictions. Notwhistanding, efforts in order to get a better level of activity and participation whithin the IODE system are being made, specially regarding the Global Data Exchange. These efforts are directed in order to get a greater presence whithin the IODE System since at a national level, our tasks has been accomplished with normality.

In a near future, it is expected to incorporate new personnel to carry out activities regardind the Global Data Exchange. This, will generate aditional needs for training on data management, which we expect to satisfy applying this people to the courses that offer the IODE System. On this subject, our country recommend to maintain, on a regular basis, the courses that COI/IODE Committee has coordinated, specially those for Spanish spoken countries and that financial costs of this courses be supported for the Comittee, specially for developing countries. This training courses should instruct and skill personnel in data management, specially in basic aspects related to control quality, clasification and inventory and in another more complex aspects like exchange formats, data flow within the IODE System, etc.

Finally, our country is making efforts to reactivate its NODC and to participate more actively within the IODE System. For this reason, we look for to incorporate us as a permanent member in the Working Group of Experts on RNODC's and Climate Data Services, and in the Group of Experts on Technical Aspects of Data Exchange.

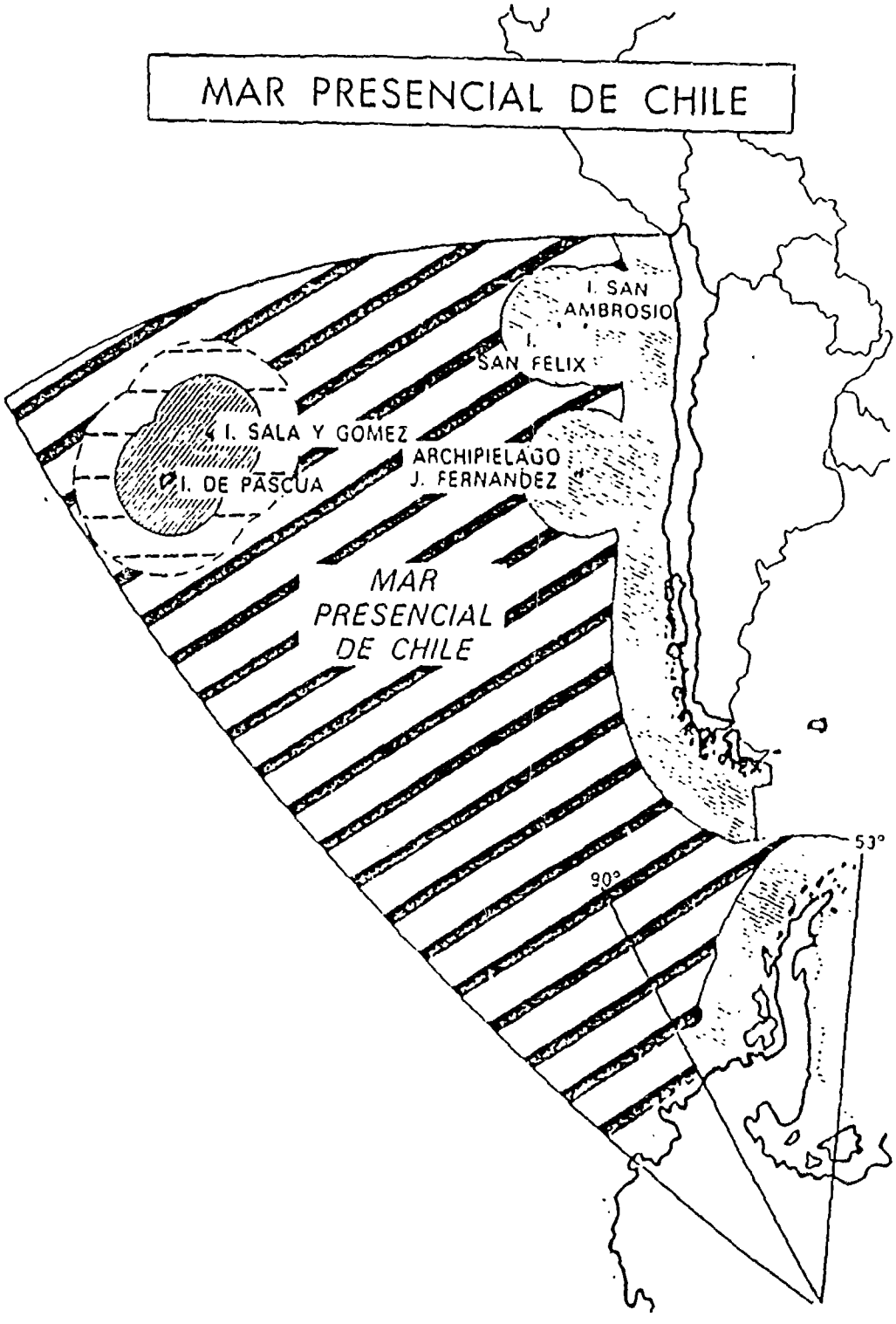



Figure Nº 1.- Map showing the areas of main interest for the National Oceanographic Data Center, including Territorial sea, Economic Exclusive Zone and an area of national presence.

# NATIONAL REPORT OF CHINA

China National Report on Intersessional Activities

Since last session, a remarkable progress has been made at the China National Oceanographic Data Center (CNODC) in the field of marine data & information activities.

## I. Marine Data Collection, Exchange & Management Activities

### 1. Data holdings

| | | |
|---|---|---|
| Coastal Station Data | | |
| Wave | 1,101 | station/year |
| Temperature & Salinity | 1,822 | station/year |
| Meteorology | 1,254 | station/year |
| Tides | 4,089 | station/year |
| Nansen Station Data | 400,000 | stations |
| Geophysical Data | 4,000,000 | stations |
| Marine Pollution Data | 43,560 | stations |
| Current | 513,546 | stations |
| Geochemistry | 11,184 | stations |
| PRC/US TOGA Cruise Data | 5,827 | stations |
| PRC/Japan Joint Research Program on the Kuroshio | 4,697 | stations |
| Biology | 30,000 | stations |
| Data Buoy Data | 600 | MB bits |
| COADS | 79,000,000 | stations |
| XBT | 364,000 | stations |
| Ship Report | 3,742,700 | stations |
| Bathymetry | 4,000,000 | stations |
| Seismic Data | 6,000 | stations |
| ADCP | 32,000,000 | recordes |
| CTD | 1,937,000 | recordes |
| Sea Level | 8 | MB bits |

### 2. Data Exchange

CNODC has exchanged data with various NODCs and marine institutions of more than ten countries and international organizations. CNODC has disseminated the Oceanographic Atlas of China-Japan Joint Research Program on the Kurushio to more than 70 countries.

3. Data Files Updated and Maintained

. Nansen Station Data File
. Ocean Current Data File
. Coastal Station Temperature & Salinity Data File
. Tidal Data File
. Coastal Station Wave Data File
. Tidal Harmonic Constant File
. Marine Geophysical Data File
. Marine Sediment size Analyzing Data File
. Oceanic Manganese Nodule Data File
. Marine Geochemical Data File
. Ship Report Data File

4. New Data Files Established

. Marine Pollution Data File
. Bathymetric Data File

5. New Files under the Construction

. Marine Mineral Resources Data File
. Coastal Zone Data File
. Sea Ice Data File
. Marine Biological Data File

6. Software Developed

. CDT and ADCP data processing software (It was designed and developed in accordance with the UNESCO's standard).
. Automated contour mapping and the related data processing software.

7. Publications

. Compiled and published the Marine Environmental Annual Report for 1991 and 1992 and disseminated it to various departments and institutions concerned;
. Compiled and published the oceanographic Atlas for the Air-sea Interaction studies in the Western Tropical Pacific Ocean;
. Compiled and published two volumes of the Oceanographic Atlas for China-Japan Joint Research Program on the Kuroshio.

8. Data Archaeology and Rescue

Effort has been made to rescue historic marine data. A certain amount of historic marine data have been collected. However, all those data are on paper sheets and need to be digitized.

9. Preparation for participation in the GTSPP

CNODC is prepared to participate in GTSPP. To support GTSPP, CNODC sent to the U.S. NODC 6818 Nansen Station data. One data expert from CNODC has been conducting joint research work combined with several GTSPP initiatives at the U.S. NODC.

10. Acting as China WOCE Data Assembly Center

CNODC has been designated as National Assembly Center for WOCE. To fulfill this task, a task team has been formed within CNODC.

11. Service

CNODC provided the data and data products service to more than 4,000 users both from home and abroad during last intersessional period. CNODC also provided national marine research programs and coastal construction projects with background report and feasibility analyses.

## II. Marine Information Activities

- Established a Marine Information Data Base;
- Set up six ASFA Sub-centers in Guangzhou, Wuhan, Shanghai, Qingdao and Beijing (2) respectively to meet increasing demand of ASFA Service;
- Provide ASFA with about 1000 abstracts extracted from more than 80 publications published in China every year;
- Compiled and published the catalog of IOC publications held in CNODC;
- Compiled and published several publications such as Marine Abstracts, Marine Information, and ASFIS Data Base Indexing and User Guide;
- Provided service to more than 1,500 users and 30 marine research projects of the nation;
- Exchanged marine information and publications with more than 80 countries and international organizations.

## III. Omnet Communication system

With the help of U.S.NODC, Omnet communication system has been set up at CNODC, which has greatly enhanced the communication among WDCs, oceanography and the NODCs. It will be used to transmit the data obtained during the TOGA-COARE Intensive Operation Period.

## IV. International Activities

1. Hosting the meeting of IOC ad hoc Group of Experts for IBCWP.

As a follow-up to a decision of the Fifteenth Session of the IOC Assembly and a recommendation of the First Session of the IOC Sub-commission for the Western Pacific, a Meeting of the IOC ad hoc Group of Experts on Ocean Mapping in the WESTPAC area was held at CNODC 12-14 June 1990. Prof. Hou Wenfeng has been nominated as a Chief Editor for the IBCWP, and CNODC has been designated as a national institution to provide the Chief Editor with the full support.

2. Hosting the WDCs (Oceanography) directors and IODE Officers Meeting, 4-8 February 1991.

3. Receiving 66 foreign visitors from various countries and international organizations to visit CNODC during the intersessional period.

## V. MIM/ASFA Training Course

In accordance with the decision made at the Twenty-fifth Session of the IOC Exctive Council, CNODC organized and hosted a training course on marine information management and ASFA as an IOC-TEMA activity during October 19-31 1992. Seven trainees from foreign countries and eight trainees from China participated in the training course. The teaching text was prepared by CNODC and all teachers were from CNODC.

## VI. Participation in various major national and international marine projects

Apart from participating in all major national marine programs, CNODC joined all international and bilateral cooperative marine research projects such as TOGA, TOGA-COARE, WOCE, PRC-US Joint Air-sea Interaction Studies for the Western Tropical Pacific Ocean and China-Japan Joint Research Program on the Kurushio, etc. by sending data specialists to collect data on board the ship. Now CNODC has become one of the important departments in implementation of national and international marine programs.

# NATIONAL REPORT OF FRANCE

## 1 - HISTORY AND OBJECTIVES OF THE FRENCH DATA CENTER (SISMER)

In the early seventies, at the beginning of the public French Research agency CNEXO (Centre National pour l'Exploitation de l'Océan), the BNDO (Bureau National des Données Océaniques), a centralized data center was created. Following a restructuration of the computer department missions in 1986, a large part of the data management activities have been stopped, except for a few selected projects (TOGA and environment monitoring). The data exchanges with the world data centres have been reduced in several disciplines and stopped for the hydrographic data.
In may 1990, SISMER (Systèmes d'Information Scientifiques pour la Mer) has been created as a new IFREMER service, established in Nantes and in Brest.
The general objective was to design and manage scientific information systems and data bases in the marine domain. More specifically, SISMER :
- maintains an inventory of the existing information systems and data sets, of the scientific in charge and of the rules of circulation;
- defines quality standards to be used for the data archiving;
- represents IFREMER within the national and international bodies concerned with data management;
- provides training and knowledge transfer in its field of competence.

## 2 - AVAILABLE DATA PRODUCTS AND SERVICES

The activities of the SISMER data centre are presented here. They consist in a few selected global data sets for which centralized archiving facilities have been required. The report will then not be exhaustive in describing the French activities in oceanographic data management . Most of the data lies dispersed among different institutes. A catalogue of those data sets is being compiled in the frame of a joint national and European project (EDMED).The availability of remotely sensed oceanographic data which are managed by specific international centres (not depending directly on the French support) are not reported either.
The SISMER data management activities are focussed on four domains : the general informations, the environment and living ressources, the basis data collected during the French sea cruises and the data management of specific national or international projects.

### a) General information systems

- French sea cruise inventory (about 3000 cruises);
- Inventory of the French marine data.

### b) Data Bases for the living ressources and marine environment domains

These data are managed by using interactive database softwares :
- monitoring networks RNO (Réseau National d'observation), REMI (REseau MIcrobiologique) and REPHY (REseau PHYtoplanctonique);
- monitoring of fish captures sampling ;
- follow-up of shell farming establishments;
- follow-up of sea products transformation industries.

### c) Management of data collected during the French sea cruises

- geophysical data ( 174 bathymetry cruises including 168 with multi-beam bathymetry, 113 gravimetry cruises and 178 magnetism cruises);
- physical oceanography data (7836 CTD profiles, 984 historical bottle cruises and 2300 current meter time series).

d) Data Management for specific projects

- TOGA/WOCE subsurface temperature data base (about 180 000 profiles).

A main effort is devoted to the development of an information server to make available the data catalogues and manage as automatically as possible, data archiving and circulation. Unix workstations, DOS PCs and relational data base software are used.

## 3 - STATUS OF GLOBAL OCEANOGRAPHIC DATA EXCHANGE

For the *in situ* oceanographic data, the exchange flow with the international data centers slowed down during the period 1986-1990, due to a drastic cut of means for data management.
Since 1990, the new SISMER service acted as the French focal point for international oceanographic data exchange.
This service is doing an effort first to inventory and assemble the basic data subjected to exchange protocols. The concerned domains are : sea cruise information, environment monitoring, bathymetry, magnetism, gravimetry, hydrography and currentmetry.
The up-dating of the data exchanges after the five years of break is not yet finished.

### The sea cruise information

The national oceanographic programme of the French research vessels is regularly transmitted to the IOC.
Besides the Annual Report of the oceanographic cruises of the national public research is distributed to 68 foreign centres located in 30 countries.

### The environment monitoring

The pollution data within the French coastal waters, sediment, fishes and shellfishes are assembled on the French environment network. They are transmitted to the ICES once a year, according to the specifications given by the Ministeries of the European Countries involved in the two following projects :
- The Monitoring Master Plan of the North Sea Task Force;
- The Joint Monitoring Programme of the Oslo and Paris Commission.

The data up to 1991 have been transmitted in due time.

### The physical oceanography data

Due to a lack of means, SISMER has just restarted some data management activity for hydrography and currentmetry (inventory of the existing data sets). It does not seem realistic to up date the exchanges with the WDCs before the end of 1993.
In the frame of the TOGA/WOCE experiment, the subsurface temperature data centralized in the Brest center have been disseminated freely on request according to the project specifications.

### The geophysical data

Concerning the geophysical data, the exchanges are considered up to date.
The bathymetric, gravimetric and magnetic data have been sent to the WDC (NGDC) in Boulder at the MGD77 format up to the 1990 data (out of the confidentiality period) after a severe control.
The monobeam bathymetry within the GEBCO has been transmitted to the Hydrographic Services for their zones of responsability.

## NATIONAL REPORT OF GERMANY

The National Oceanographic Data Center of Germany, the "Deutsches Ozeanographisches Datenzentrum" (DOD) operates as a branch of the marine research department of the "Bundesamt fuer Seeschiffahrt und Hydrographie" (BSH) in Hamburg, the former "Deutsches Hydrographisches Institut" (DHI). DOD has full access to the CDC mainframes of the computer center; hard- and software specifications as well as data bases are nearly the same as given during IOC/IODE-XIII.

### 1. Progress Report & Information Management

In the past two years DOD's activity was highly influenced by the German unification. DOD in Hamburg remains the National Oceanographic Data Center with the task to make inventory of the whole marine data gathered in the former GDR and take them into archives of the national data centre, i.e., all historic data, but also the data from on-going research and monitoring programmes. Closest connections were developed to the institute for marine research in Rostock-Warnemuende, now the "Institut fuer Ostseeforschung Warnemuende"(IOW); the progress made may be judged by the following three examples:

- the information and communication set-up in the IOW is now running in a CDC-environment, thus enhancing fast data and information exchange by using the same systems as BSH/DOD.

- nearly all CTD-data and hydrochemical data sampled by the research vessels "*Alexander von Humboldt*" and "*Professor Albrecht Penck*" for the period 1985-1991 are taken into DOD-archives and available in the database. Part of this data set also is a major contribution to the Quality Status Report of the North Sea within the North Sea Task Force (NSTF). Both ships as well as other "new" research vessels are fully integrated in the ROSCOP/Cruise Summary Reporting system by submitting forms to DOD within one week after the end of the cruise.

- Within the EDMED-project, "Completion of the European Directory on Marine Environment Data for All EC Member States", for which DOD forms the national focus in Germany, the IOW in Warnemuende was the first institute to submit all required information ready to send and complete. However, a vast amount of data has to be worked up, documented and entered into machine readable forms before it can be part of the archive within DOD. This is especially true to pollution related data as well as whole sediment data, both on physical and chemical parameters.

The second highlight is the on-going process of loading all data held in the DOD as files into a relational database. Because not only physical oceanographic data, water chemistry data as well as CSR and platform information are loaded but also pollutant data of water, sediment and organisms (inclusion of the last compartment is just ahead), this database is called "Meeresumwelt-Datenbank" (marine environmental data base) MUDAB. The MUDAB-system now in operation within the DOD may differ from other NODC's inasmuch of its regional coverage.

Due to national and international duties, also data derived from the main rivers are archived, both hydrological and chemical, but also loads and riverine input data.

- **Media Covered**

Besides data from the water phase, also atmospheric input data are stored, both national as well as from the whole Convention area of the Oslo and Paris Commissions. Sediment data of the North Sea are stored from the last century onwards.

- **Inclusion of Biological & Biological-effect Data**

Biological data on primary production, plankton and benthos are archived in a routine way now. Data exports to the different formats required by different Commissions still has to be enhanced. Biological-effect data as data on fish diseases in connection with contaminants in fish, shellfish and birds are stored as new data types.

- capability of storing such diverse data types as on oil spillages or the pollution load data for the whole Baltic Sea, including input data from rivers, municipalities and industries, all per individual item or in a summarized figure.

## 2. Further Development

The on-going development of that database as well as product instruments is facing the transition to an open UNIX-system. Furthermore, on-line access to the database is already operational now for other institutes in Germany and will be extended in the near future.

## 3. Status of the Global Data Exchange

Recently, a major data submission was sent to ICES, WDC-A & WDC-B by DOD, which particularly might be of interest for GTSPP. Monitoring data is given to the corresponding national and international bodies on a routine basis by DOD. Mostly formats set up by ICES are used, while GF3 is mainly used for CTD-data.

## 4. Participation in Global Ocean Climate Projects

Very recently, 26-28 October 1992, the WOCE Hydrographic Programme Planning Committee (WHP-11) was hosted by DOD in Hamburg. DOD has the mandate to act as a Special Analysis Center (SAC) for WOCE-data. Within this SAC the following institutions are closely co-operating:

- National Oceanographic Data Center of Germany, the DOD
- Institut fuer Meereskunde (IfM), Hamburg, and
- Max-Planck-Institut fuer Meteorologie (MPI), Hamburg.

Thus, DOD is fully engaged in WOCE activities. Also, DOD acts as the national focus for the German contribution to the JGOFS project.

NATIONAL REPORT OF GREECE

National Report on Intersessional Activities

## 1. Data Collection

Several oceanographic data collection programmes are currently in progress in Greece that provide a wide range of data types. Most of the programmes are carried out by large marine research organizations and university departments. These activities include the implementation on several development programmes, as well as, on international research projects, (PEOM, MEDPOL, EURECOMARGE, MIRAMHER, etc.). Within the framework of these research projects systematic multidisciplinary surveys are currently carried out in all extensive network consisting of large number of oceanographic stations dispersed in the waters of a wide region of the Eastern Mediterranean Sea (Aegean, Ionian, Levantine Seas and Sea of Crete).

## 2. Hellenic National Oceanographic Data Centre (HNODC)

The Hellenic National Oceanographic Data Centre (HNODC) was established in 1986, as part of the National Centre for Marine Research (NCMR). It operates as a national agency, responsible for cataloguing, archiving, processing and distributing marine data and information and furthermore for promoting the international exchange of data participating in the IODE system of IOC. In addition, HNODC provides active support to scientists making up their data and carries out work in developing techniques for the processing, display and dissemination of oceanographic data using computer technology.

## 3. HNODC - Manpower and Facilities

At present HNODC has a staff of 3 oceanographers and computer experts, one of them acting also as HNODC's manager. At the earlier stages of the establishement of the HNODC a large number of personal computers IBM PC/XT and AT compatible were used for the storage and processing of national oceanographic data and information. The lack of suitable computer facilities, for a long time, delayed the expansion of HNODC's capabilities considerably. However, a great development, concerning computer facilities, was noticed during the intersessional period when a new computer system supported by a variety of peripherals was purchased. Some technical characteristics of the computer system are listed below:

### Hardware:

- Basic ETHERNET/LAN Network Equipment
  - HP 9000/825S MiniComputer (as peripheral and communication server)
    - 16 MB main memory
    - 1.2 GB disk storage capacity
    - 1/2 inch tape, 1600 and 6250 bpi, 9 tracks unit
  - HP 9000/750 Server (as Network and Database Server
    - 64 MB main memory
    - 2.7 GB disk storage capacity
    - DAT/8 GB
    - CD ROM

    HP 9000/730 Work Station
    - colour 19" high resolution monitor
    - 32 MB main memory
    - 470 MB hard disk
  - HP 9000/710 Work Station

- colour 19" high resolution monitor
- 16 MB main memory
- 470 MB hard disk

■ Other Equipment
- IBM/PC compatible microcomputers
- 600 lpm line printer
- Laser printers
- HP Draft-Master II plotter
- ASCII terminals (3 pieces)
- Colour high resolution X-terminal
- X.25 communication card

**Software:**
- Compilers: C, C++, Fortran 77, Pascal
- Scientific Libraries: SPSS, NAG
- Graphic Libraries: GKS, Starbase, IMSL
- Data Base Management System: Oracle RDBMS
- Geographic Information System (GIS): GENASYS
- Other Software: Developers productivity tools (debugers, editors, etc.), word processors, spread sheets, other programmes developed by HNODC.

The HNODC was recently connected with the Hellenic academic network ARIADNE. This enables the connection of the HNODC with several national marine research and data collecting laboratories and also with all international research centres and NODCs which are connected to their National Networks.

## 4. HNODC - Data Holdings

At present, major data holdings of the HNODC are moored current meter data, CTD data, geophysical data (bathymetry, gravity, magnetics) and water bottle data. In addition to the above data holdings of the HNODC, NCMR handles a great diversity of different types of marine data, such as biological data (plankton, benthos, etc.), sedimentological data, chemical data (nutrients, heavy metals (in sea water, sediments, fish), hydrocarbons), as well as, fisheries data, etc. The latter data will be transferred to the HNODC as soon as an integrated system will be developed to accommodate this data diversity.

## 5. HNODC - Future Plans

A major effort during the intersessional period was made by the HNODC for the development of a national data base of CTD data, with funding provided by the Commission of European Communities and the Greek General Secretariat for Research and Technology. This work, which is now in progress, will be continued and is expected to be completed in early 1994. Furthermore, the HNODC is intending to continue to develop its existing data management activities and services and to expand in new areas (e.g., archiving chemical, biological, sedimentological and marine meteorological data)

The introduction of the new computer system described above will provide a major improvement in the HNODC's ability to manage data and to more fully meet the needs of the Greek marine science community. In addition, it will enable HNODC to more effectively fulfill the duties of a National Oceanographic Data Centre, concerning its international data exchange obligations.

## 6. HNODC - International Activities

During the intersessional period a scientist of the HNODC attended the training course on the usage of GF3 (organised by IOC and the Hydrometeorological Institute of USSR) which took place in 1990 in Obninsk (Russia). In addition, within the framework of a protocol for the scientific and technological cooperation between Greece and the People's Republic of China, visits were exchanged between scientists of the HNODC and the Chinese Marine Data and Information Service, aiming at establishing of a scientific and technological cooperation between the two data centres, in the field of marine data and information management.

In 1991 HNODC participated in the EDMED (European Directory of Marine Environmental Data) Project [funded by the Commission of European Communities through a supporting initiative to the CEC Marine Science and Technology (MAST) Programme], and recently completed a directory of the marine environmental data sets in Greece.

NATIONAL REPORT OF INDIA

# STATUS OF OCEANOGRAPHIC DATA MANAGEMENT

# AT INDIAN NATIONAL OCEANOGRAPHIC DATA CENTRE,

at
National Institute of Oceanography,
Dona Paula, Goa-403 004, INDIA.

Exciting challenges lie ahead not only for the marine scientists but also for those involved in the management, banking and dissemination of data collected at sea. Progress in marine science depends not only on the ability of the oceanographer to collect, process and analyze his own data, but also on the extent to which he has access and work with data collected by other scientists in other laboratories both at home and abroad. And so computer based data management has become an essential component of modern oceanography.

Ocean study is inherently interdisciplinary and therefore calls for a controlled and integrated approach for information generation, processing and decision making. In this context, Indian National Oceanographic Data Centre (INODC) of NIO has been recognized as a national facility to acquire, process, store and disseminate the oceanographic data pertaining to Arabian Sea, Bay of Bengal, Laccadive Sea, Andaman & Nicobar Sea and the Indian Ocean.

Expenditure on oceanographic research is very high. Despite the large amount of money and efforts in such data collection, the density in time and space of the available data from the oceans in general remains low. Data are valuable not only to the primary users, responsible for its original collection but also to a wide range of secondary users. Thus a centralized management of oceanographic data not only improves the availability of data to end-users but also ensures that the data are preserved for long-term use.

## Objective

The main objective of the INODC, is to acquire, store, and disseminate entire spectrum of oceanographic data and thereby, satisfy, as far as possible, the needs of marine scientists and user communities in respect of oceanographic data. The data centre ensures that the user gets good quality and accurate data which can generate useful information.

## Major Functions

The following functions are defined, in order to fulfill these objectives,

I. Acquisition of data & information: INODC acquires data and information from 1) NIO scientists & Scientists from other national organisations 2) Govt. depts. and 3) Data centres of other countries.

II Processing (coding & quality checking): The data and information acquired is reformatted, checked for its quality and accuracy wherever possible and compressed to suit computer aided storage system. This centre sorts out inventory level information and assigns INODC numbers to each station and cruise and does the computations for derived parameters wherever necessary.

III Storage (Database Management): Data centre stores inventory level information in Station Inventory Information system and actual data in Integrated File System for efficient data management.

IV Preparation of data products: Inventories, atlases, charts, data reports, directories etc. are various data products that the INODC publishes.

V. Dissemination of data: As per users demand, processed archived data is made available to end-users in suitable formats on magnetic media and paper prints.

## Quantum Of Data Holding

The INODC holds the data collected by NIO and other marine data generating organisations and also holds data collected during the International Indian Ocean Expedition. In addition to this, data base of the centre has been enriched by purchasing data from Institutes and Data Centres of other countries. The quantum and type of data available at the INODC is given in Table no. 1.

INODC's major area of interest is Indian Ocean in general and its two arms viz. the Bay of Bengal and the Arabian Sea in particular. More emphasis is laid at present on the data of the Exclusive Economic Zone of India which covers about 2.01 million $km^2$ along India's coastline of 7517 Km including that of Laccadive and Andaman & Nicobar coasts. The above mentioned stations are therefore spread over in these areas of the Indian Ocean.

## Oceanographic Data Organisation

INODC has designed, discipline-wise and parameter-wise data formats for systematic acquisition and dissemination of data. Centre prefers to receive data in fully processed form, on magnetic media and in prescribed formats. However, Data Centre may receive data in raw form, on printed data reports, other hard copy forms or in analog form. These data are converted to digital form before further processing.

For the purpose of management, oceanographic data is classified as,

1. Station data : From a stationary research ship/platform
2. Underway data : From a moving ship (geophysical data)
3. Time series data : From moorings & drifting buoys
4. Satellite data : Remote Sensing data

**Data Treatment**

The data submitted to INODC is reviewed to ensure that it is accurately described to characterize the data type and to determine if it is suitable for processing. Conversion into INODC formats is required if it is in raw form. Analog charts are screened for obvious errors or omissions and then digitized for computer storage.

Data Centre, at present, does not have an absolute check on the data accuracy. However, certain methods are employed to point out the coding errors and the suspected data. Quality control programs check for completion of mandatory fields, expected ranges for fields and similar items. The suspected or erroneous data are flagged and some data are even omitted if necessary. The data sets are assigned INODC reference numbers that are recorded in inventory data base. INODC identifies oceanographic information at four levels,

I. Inventory level information
II. Parameter level information
III. Documentation information
IV. Actual numerical data

Inventory level information includes geographic location of the stations, cruise details and INODC number as reference key field. Parameter level information includes various parameters observed at each station along with their respective 'Report On Samples/observations Collected during Oceanographic Programs' (ROSCOP) codes which are accepted Internationally. Data level information includes processed numerical data and INODC number as reference key field.

The inventory and parameter information is stored in Station Inventory Information System (SIIS) developed using "INGRES RDBMS" database package available on AViiON 4000 minicomputer working under UNIX environment. Numerical data is stored as individual tables using INGRES RDBMS adopting Integrated File System structure (IFS).

**Database Management Systems**

The Data centre has developed the following systems and subsystems for the management of various types of data,.

A) Oceanographic Station Inventory Information System SIIS)
B) Integrated File System (IFS) for numerical data storage

C: Geophysical Data management system (GPDMS)
D) Oceanographic Data management using INGRES RDBMS.

A. On-line Oceanographic Station Inventory Information System (OSIIS)

Oceanographic inventory information of the data collected during RV Gaveshani and ORV Sagar Kanya cruises have been organised and structured using popular dBase III PLUS data base package available on DCM PS/386 microcomputer and working under MS-DOS environment. Using dBASE command level programming language, software modules are developed additionally, to support built-in-capabilities of dBASE III, for developing a very user friendly online system.

The system developed, is capable of carrying out major functions such as 1) systematic storage and management of data, 2) selection of inventory information as per user's demand, and 3) preparation of catalogues and reports.

B. Integrated File System (IFS)

An Integrated File System (IFS) is designed for management of Oceanographic Data and Information. This system has three hierarchical level. The system basically provides the storage facility for all categories of oceanographic data. Each category has four levels. Levels 1 and 2 are assigned for inventory and documentation information while actual digital data is stored in 3rd level. Level 4 contains additional information related to some special types of data.

C) Geophysical Database Management System (GPDMS)

GPDMS is designed for the computerized storage and easy retrieval of marine geophysical data and information, GPDMS is subdivided into various databases depending upon disciplines. Disciplines that are included in the present database system are navigation, bathymetry, magnetic and gravity. Navigation database which contains Inventory level information along with assimilation and search modules and the geophysical database resides on AViiON 4000 computer system.

GPDMS is a user friendly computer software system that a) processes underway marine geophysical data for entry into a database with a common structured format b) provides inventory and data retrieval capabilities, and c) presents information in graphic form.

D) Oceanographic data management using INGRES RDBMS

A relational database management system, "Integrated Graphics Retrieval System", popularly knows as "INGRES RDBMS", is recently being used by Data Centre for oceanographic data management operations. INGRES RDBMS stores data in flexible databases. In a database the information regarding a particular object is

stored in Tables. Hence following tables are generated and information pertaining to individual parameter has been stored.

| Table name | No.of Records |
|---|---|
| 1. Station Inventory Information | 9644 |
| 2. Time series inventory information | 2739 |
| 3. Bathythermograph (BT) | 4388 |
| 4. Nansen cast data | 46301 |
| 6. CTD | 23045 |
| 7. Wave records | 1431 |
| 8. Surface meteriology | 3312 |
| 9. SST (sea truth data) | 4922 |
| 10. SST (Remote Sensing data) | 870 |
| 11. Chemistry | 23615 |
| 12. Primary Production, chlorophyll | 2257 |
| 13. Zoo Benthos (Biomass) | 669 |
| 14. Zoo Plankton (Biomass) | 2458 |
| 15. Geochemistry of Sediments | 720 |
| 16. Geophysical data | 1,17,739 |

INGRES RDBMS (VER. 6.4) is loaded on PCS/DG's AVIION 4000 mini computer system (Appendix 1) which is working under UNIX (VER. 5.4) operational system. INGRES RDBMS with several advanced features like, user interface, 4th generation language, application development tools and embedded query language etc., is being used for data management activities like, data storage, updation, selection, conditional retrieval, report writing, processing and analysis.

Data Dissemination

For dissemination purpose the data is divided into the following three categories:

1. Open data : Data collected from international waters i.e. beyond Exclusive Economic Zone.

2. Restricted data : Data collected within the exclusive Economic Zone.

3. Classified data : Certain types of data depending upon the nature may be classified as sensitive and such data would not be available for exchange or dissemination purpose.

Open data and to some extent Restricted data are made available to users according to guide lines.

User Inquiries Handling

On-line Station Inventory Information System also provides an easy and user-friendly access for selecting inventory information as per users demand. Query handling system of ISIS searches and sorts the required information depending upon users specification (Geographic area, depth, season etc.) and stores

it in a new data base. Selected inventory level information is correlated with corresponding data sets with the aid of unique INODC numbers and required data is retrieved.

The data is disseminated in the form of hard copies (printout) or magnetic media (tapes and floppies). The data can also be supplied/exchanged in internationally accepted General Format (GF-3), if user requires. The INODC/NIO provides the guidelines for dissemination of oceanographic data through a booklet "Guidelines for the Distribution and Exchange of Samples and Data", which also contains a specimen of the request form. Inspite of the charges mentioned in the guidelines, the INODC/NIO is taking a liberal view. The centre, nevertheless, prefers to exchange data.

**Oceanographic Data Products**

The Data Centre is engaged in compilation of data and bringing out the data products for user's convenience. The following products have so far been brought out.

1. Inventory reports (total 10 nos) : Stations and cruises inventories have been published in nine reports. These reports contain the inventory information of R.V. Gaveshani (1976-88), ORV Sagar Kanya (1983-88), Sagar Sampada (1985-86) and R.V. Samudra Manthan (1983-86). One inventory report pertains to 13 geophysical cruises and 6480 fixes of R.V. Gaveshani for the year 1983 to 1988.

2. Data reports : Following data reports have been prepared from data collected onboard RV Gaveshani and ORV Sagar Kanya.

Data Reports:

I. Mechanical Bathythermograph Data Reports.
II. Surface Meteorological Data Reports.
III. Nansen Cast Data Reports.
IV. Chemical Data Reports.
V. Zooplankton Biomass Data Reports.
VI. Geochemistry of sediments - data report.
VII. Sea Surface Temperature data report.

3. Oceanographic Atlas: Three oceanographic atlases have been prepared. Oceanographic atlas of EEZ of India incorporates physical, chemical and biological data collected during 1976-80 and shows the general annual distribution at different depths. The atlas of Mechanical Bathythermograph data gives composite plots of seasonal variation of temperature profiles drawn against depth, in each square degree grid. The Geophysical Atlas of Eastern Arabian Sea display Bathymetry, Magnetics and Gravity data as maps, anomaly maps, profiles and 3-d sea bottom topography plots. Detail data product list is given in Appendix 2.

## International Involvements

NIO is actively participating in various International projects, which includes, TOGA, WOCE, IGBP, Climate Project etc. Analysed data, generated from these projects, is being received by Data Centre from time to time. Data Centre is exchanging and also purchasing oceanographic data from WDC, NGDC, JODC, UK-NODC, etc.

## Personnel size

Data Centre has at present 9 permanent staff member and other 3 members are working under project. Details of personnel size is as follows,

| | |
|---|---|
| Scientists | 6 |
| Research Fellow | 3 |
| Technical Persons | 3 |

## Budgetary Size

The Data Centre receives funding from Central Government to carry out it's on-going data management work. This amounts to almost Rs. one million annually which includes the wages, contingency and other infra structure expenses. Besides this, considerable fund are made available to Data Centre from Grant-in-aid and sponsoered projects for specific work.

## Problems and Constrains

1. Data flow from data generators to data managers is not continuous and smooth.

2. Non availability of standard quality control procedures in general and for biological and chemical data in particular.

3. Insufficient funds for purchasing standard softwares.

4. Lack of proper coordination between primary data generators, data managers and final users.

5. Inadequacy of trained manpower.

TABLE 1

| Sr. No. | Discipline | Parameters | No. of stations for which data is available |
|---|---|---|---|
| 1. | Physical Oceanography | (Nansen cast) Temp, salinity STD/CTD,MBT,XBT,DBT wave, currents,and surface meteorological data. | 24661 |
| 2. | Chemical Oceanography | $O_2$ $PO_4$,$NO_3$, $NO_2$, $SiO_3$, pH, $NH_4$, major chemical elements, trace metals and toxic elements. | 23471 |
| 3. | Biology | Chlorophyll, productivity rate, Zooplankton and Benthos. | 3640 |
| 4. | Geology | Grain size, sediment composition, sediment load, foraminifera and geochemistry. | 2120 |
| 5. | Geophysical | Bathymetry, Gravity, Magnetics and Seismics. | 125113 (line Kms) |

Quantum and type of data available at INODC.

APPENDIX 1

Computer facilities available at INODC

Hardware

1. PCS AV 4000 (19 MIPS) Motorolla single CPU 88100 RISC Processor with -

   a) Two 64 KB cache and memory management units.
   b) Floating point unit.
   c) Ethernet LAN interface.
   d) 32 MB byte parity RAM.
   e) Standard SCSI interface for Disk and Tape.
   f) Two RS-232C serial ports (16 lines).
   g) Centronics - compatible parallel port.

2. 150 Mb QI cartridge tape drive.
3. 662 Mb Winchester Disk drive.
4. 332 Mb Winchester Disk drive.
5. 1600/6250 bpi, 9 track tape drive.
6. Four VI 220 terminals.
7. Two PC-XT (640 Kb)
8. One Dot Matrix Printer.
9. CD-ROM reader
10. One HP Laser jet printer
11. Two PS/386 systems
12. One Reprographic Machine.

Software

1. DG/UX 4.3 operating system with standard utilities.
2. FORTRAN
3. RDBMS - INGRES
4. COBOL compiler
5. C - compiler
6. PC Terminal Emulation (I-LINK)
7. X Window.

Manpower in INODC

1. One Scientist E-II.
2. One Scientist E-I.
3. Two Scientist C.
4 Two Scientist B.
5. One Junior Technical Assistant.
6. Three Research Fellows.
7. Two Data Entry Operators.
8. One Stenographer
9. Two Lab Assistants.

Other Infrastructure

1. One Reprographic Machine.

## APPENDIX 2

## DATA PRODUCTS

The following data products have been brought out for the convenience of users.

Inventories:

1. Inventories of stations and cruises of R.V. Gaveshani (1976-91) and ORV Sagar Kanya (1983-91).
2. Inventory of cruises and stations of FORV Sagar Sampada (1985-1988).
3. Inventory of Geological Samples collected during cruises of R.V. Gaveshani (1976-85).
4. Inventory of Geophysical cruises and fixes from cruises of R.V. Gaveshani (1980-88).
5. Time series station inventory for ocean measurements.

Data Reports:

1. Mechanical Bathythermograph Data Reports.
2. Surface Meteorological Data Reports.
3. Nansen Cast Data Reports.
4. Chemical Data Reports.
5. Zooplankton Biomass Data Report.
6. Geochemistry of sediments - data report.
7. Sea Surface Tempreture data report.

Atlases:

1. Oceanographic Atlas of the EEZ.
2. Atlas of Mechanical Bathythermograph Data.
3. Geophysical Atlas of Eastern Arabian sea.

General:

1. Indian National Directory of Marine Research Projects.
2. Indian National Directory of Marine Scientists.
3. National Guidelines for the Distribution and Exchange of Samples and Data.
4. Station Coverage in the Exclusive Economic Zone of India.
5. Integrated Inventory Information System (IIIS), Communica tion, Computer Society of India, January 1988 pp: 25-30.
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11. Ocean data summary in EEZ of India.

# NATIONAL REPORT OF INDONESIA

**Status, Development & Problems**

## 1. INTRODUCTION

Located between the Pacific and Indian Ocean and between the Asian and Australian continents, the Indonesian Asian Seas are strongly influenced by monsoonal climate pattern. Indonesian seas form the only tropical inter-ocean link between a reservoir of warm surface water of the Western Pacific with the Eastern Indian Ocean. The water mass and heat flux exchange between the two oceans through this link is estimated to be considerable and has a large, perhaps even global scale, impact on the ocean climate.

Nearly all type of bottom topographical features are found in Indonesian waters, such as shallow continental slope, volcanic and coral islands. In its distribution of water and land alone the Indonesian region is one of the most complex structures on earth. The numerous large and small islands devide the waters into different seas connected by many channels, passages, and straits. The complexity of the region is the reason why it has drawn many major international oceanographic expeditions, such as the CHALLENGER (1982-75), the GAZELLE (1875), the VALDIVIA (1899), the SIBOGA (1899-1990), the PLANET (1906-1907), the SNELLIUS (1929-1930), the SPENCER F. BAIRD ((1947-1950), and the GALATHEA (1951). In recent years, a few oceanographic cruises have been organized, locally or as part some cooperative regional studies, such as the Intergovermental Oceanographic Commission (IOC) Cooperative Study of Kuroshio which covers also the South China Sea, the International Indian Ocean Expedition (IIOE) and the SNELLIUS II EXPEDITION (1984-1985). It is thus furtunate to have a fairly good picture of the general oceanographic characteristics of these waters. For more detail review one can consult Wyrtky, 1961, and Soegiarto and Birowo, 1975.

In the last decade, there have been rapid progresses in the development and utilization of marine resources corresponding to the outstanding progress of scientific technology in various area. This progress resulted the increasing demand for various information such as water temperature, ocean current, topography of the ocean floor and others. An enormous amount of money and time for the research have been spent for collecting these data. Marine environmental data is valuable not only to the primary users responsible for its original collection, but also to a wide range of secondary users and others. In order to make the data and information easily and speedy to access, there is a need to develop a marine information system which provides such as data and information letter for research purposes or as an aid in decision making process.

## 2. INDONESIA AND GLOBAL CLIMATE RESEARCH

### 2.1 The role of Indonesian seas in the global climate change.

The Indonesian Seas reperesent the only tropical inter-ocean link, connecting the reservoir of warm and fresh surface water of the western Pacific with the eastern Indian Ocean, while transforming it through vertical mixing and air-sea interaction on its way. The heat and water mass flux between both oceans through this link is estimated to be considerable and have large-scale, even perhaps global scale, impact on the world climate. This phenomenon is called Indonesian Throughflow (ARLINDO).

Water mass analysis shows that a large wedge of water characterized by admixtures of Pacific origin spreads from the Indonesian Seas wesward across the entire width of the Indian Ocean in the upper 1000 m. The available water mass data show that most of the throughflow water is of North Pacific origin but some South Pacific contribution, derived from the South Pacific thermocline and spreading along the northern coast of Irian Jaya or even across the shallow Torres Strait, can not be ruled out. The more uncertain aspect of the water mass source is the path followed by the Pacific to Indian Ocean through flow. The path within the Banda Sea and the relative contribution of the Maluku and Banda Seas path versus the Makasar Strait is not resolved nor are the ventilation characteristics of the deep basins and their contribution to througflow at the 1000 meter level.

The mean pressure head across the Indonesian Seas between the Western Pacific and the eastern Indian Ocean is approximately 10 cm, supporting the conclusion of a mean flow from the Pacific to the Indian Ocean. But apparently there is not yet agreement on its magnitude, its seasonal and interannual varibility. Various estimates of the mean through flow transport have been made, using different methods. Clearly, there is agreement among all of them that the mean flow is from the Pacific to the Indian Ocean, but there is wide range of estimates of its magnitude. Very little evidence is available as base for speculation on magnitude and time scales of throughful variability. The monsoonal wind force generates a strong seasonal cycle in some of the Indonesian passages and seas, e.g. the north-south sea level slope across the East Java sea changes from 10 cm northward in August to 10 cm southward in February, but it is not known what effect this wind force has on the throughflow transports themselves.

Another phenomenon as part of the Pacific Indian Oceans interaction is the "Southern Oscillation" or better known as the "El Nino". This phenomenon generates adverse climate effects regionally, the whole Pacific basin, even also globally. Therefore, at present a regional and international studies on the "El Nino Southern Oscillation" (ENSO) is undertaken throughout the Pacific and the Indian Ocean.

**Institutional Cooperation**

From the above description, it is clear firstly the important of Indonesian seas on the role they play in the local, regional as well as global climate. The second conclusion we could draw so that no one institution could carry out her own research independently. The reason quite obvious, global climate is related to many aspects of marine sciences such as meteorology, physical and chemical oceanography as well as marine biology Therefore, it is imperative that institutional cooperation should be developed in order to study this problems appropriately.

Fortunately, marine research activities in Indonesia involved several agencies where type of data collected depend on institutional mission. Type of data collected by each agencies can be discribed as shown in Table 1 :

Table 1. Agencies involved in marine research and type of data collected.

| Agencies | Type of data |
|---|---|
| Research and Development Centre for Oceanology - LIPI (RDCO) | Physical, Chemical<br>Biological |
| National Hydrographic Office (DISHIDROS) | Tide |
| Marine Fisheries Researcch Institute (BL) | Fisheries including<br>Acoustic data |
| Assessment and Application Agency for Technology (BPPT) | Oceanography |
| National Coordination Agency for Survey and Mapping (BAKOSURTANAL) | Tide and Remote Sensing |
| National Institute of Aeronautics and Space (LAPAN) | Oceanographic (using satelite) |
| Meteorological and Geophysical Agency (BMG) | Meteorology |
| Marine Geological Institute (MGI) | Marine Geology and Geophysic |

Recognizing this issue, the Indonesian Government established in January 24, 1990, an organization dealing with climate change which is named **Committee on the Monitoring and the Evaluation of the Effect of Climate Change on the Environment.** This organizations is coordinated by the State Ministry for Population and the Environment and consisting of members/representatives from many government institutions and NGO. The aims of this organization are, among other things, to establish a discussion forum to gather opinions for the formulation of national stra- tegic policies. Among the activities are meetings and workshop to prepare a concept on the National Strategy in the anticipation of climate change caused by green house gases. This organization is also entitled to evaluate proposed activities (including research) related to climate change by any national or foreign organization.

Members of the organization consists of many government institutions, universities and NGO which are involved in one or more of the following activities: research and monitoring , data management, training and policy making. Table 1 shows institutions and organizations involving in different field of activities. Indonesia is also active in international organizations which are concerned with global climate change such as IGBP (International Geosphere and Biosphere Programme), IPCC (Intergovernmental Panel on Climate Change), WCP (World Climate Programme), TOGS (Tropical Ocean Global Atmosphere), ASCA (The Association for Science Cooperation in Asia) and others.

Table 2. Various Indonesian Agencies involved in global climate change related activities.

| No. | Agencies | Type of Activities | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | A | B | C | D | E | F | G |
| 1 | Research and Development for Oceanology | + | + | + | | | | + |
| 2 | Agency for Assessment & Application of Technology (BPPT) | + | | + | + | + | + | |
| 3 | National Coordination Agency for survey and Mapping (BAKOSURTANAL) | + | + | | | | | + |
| 4 | Agency for Meteorology and Geophysics (BMG) | | | | + | | | |
| 5 | Naval Hydrooceanographic Office | + | | | | | | |
| 6 | National Agency for Aeronautics and Space (LAPAN) | | | | + | | - | + |
| 7 | Department of Agriculture | | | + | + | + | | |
| 8 | Department of Communication | + | | | | | | |
| 9 | Department of Forestry | | | + | + | + | | - |
| 10 | Department of Public Works | + | + | | | | | |
| 11 | Department of Health | | | + | + | | | |
| 12 | Department of Industry | | | | + | + | | |
| 13 | Agency for Environmental Impact Control | | | | + | | | |
| 14 | State Ministry for Population and the Environment | + | | + | + | + | | |
| 15 | Universities | + | | | + | + | | - |
| 16 | NGO | | | + | + | | | |

Legend :

A = Research and monitoring of sea level and/or oceanography
B = Coastal mapping
C = Biodiversity management and monitoring
D = Green House Gas (GHG) monitoring
E = Inventory of GHS sources and sink
F = Dynamics of atmosphere
G = Training

## 3. OCEANOGRAPHIC STUDIES RELATED TO GLOBAL CHANGE

Several oceanographic and meteorological research activities have green implemented and planned to anticipate the global climate change. These activites was and will be implemented by governmental institution or through international joint cooperation, Hahude (1991) classified these into present status and future programs.

## 3.1 Present status

### 3.1.1 Oceanographic researches

On going research programmes that are being undertaken by Indonesia and can be related to global change studies at present include :

**1). Project on Tides and Tidal Phenomena**

This project is directed to the observation and collection of tidal data in seven location in the western Indonesian Archipilago namely at Lhok Seumawe, Pasir Panjang, Tarempa, Pulau Pari (Jakarta), Pontianak, Tarakan and Banyuwangi (Figure 1 and Table 3). These tidal stations have been operated since 1987 and will be continued up to the year 1994. The seven stations of Indonesia is part of about 25 tide stations presently operated by the ASEAN countries with the financial and technical assistance from the Australian Government in Indonesia this project is carried out by RDCO (Research and Development Center for Oceanology-Indonesian Institute of Sciences) in cooperation with DISHIDROS (Hydro Oceanographic Service of the Indonesian Navy). A part of these 7 stations the BAKOSURTANAL (National Survey and Mapping Coordinating Agency) a non ministerial government body, operatesother 16 tidal stations througthout Indonesian Archipelago (Table 3 and Figure 1). The primary objective of the tidal study they made for determination of the mean sea level as the basis for geodetic application throughout Indonesia. However the tidal data collected can also be used for the purpose of global change studies specifically to monitor the strength and variability of the ARLINDO. The study of sea level rise due to global warming of these stations are carried out with the cooperation and assistance of the TOGA Sea Level Center in Hawai.

**2). JADE (Java-Australia Dynamic Experiment)**

The project is a cooperation between Indonesia and France. The executing agencies in Indonesia are RDCO, DISHIDROS and BPPT (the Agency for the Assessment and Application of Technology, a non-ministerial government body) and in France is LODYC (Laboratories d'Oceanographie Dynamique et Climatologie) of the University of Paris VI.

Under this programme an oceanographic cruise has been carried out in the Indian Ocean southwest of Sumatra and south of Java to Sumbawa in August and September 1989 The ship used was the R.V. "Marion Dufresne" of TAAF (Terres Australes et Antarc- que Francaises) in France. Sixty-seven Oceanographic stations have been occupied during the current meter series were installed southwest and east of Roti Island (Figure 1).

The primary objective of the study is to assess the strength and variability of ARLINDO at its outgoing flow into the Indian Ocean and to learn the effect of mixing on the water masses characteristics during their passage from the Pacific to the Indian Ocean. The preliminary results of geostrophic calculation indicate that the major flow of ARLINDO occurs in the apper 500 m with transport magnitude of about 16 million $m^3/s$. Intensive mixing also occurs at about this level. The moored current meters were retrieved by the French and Indonesian marine scientists in September 1990 using the Indonesian R.V. "Baruna Jaya I" after one year of operation and the data are still being processed in France.

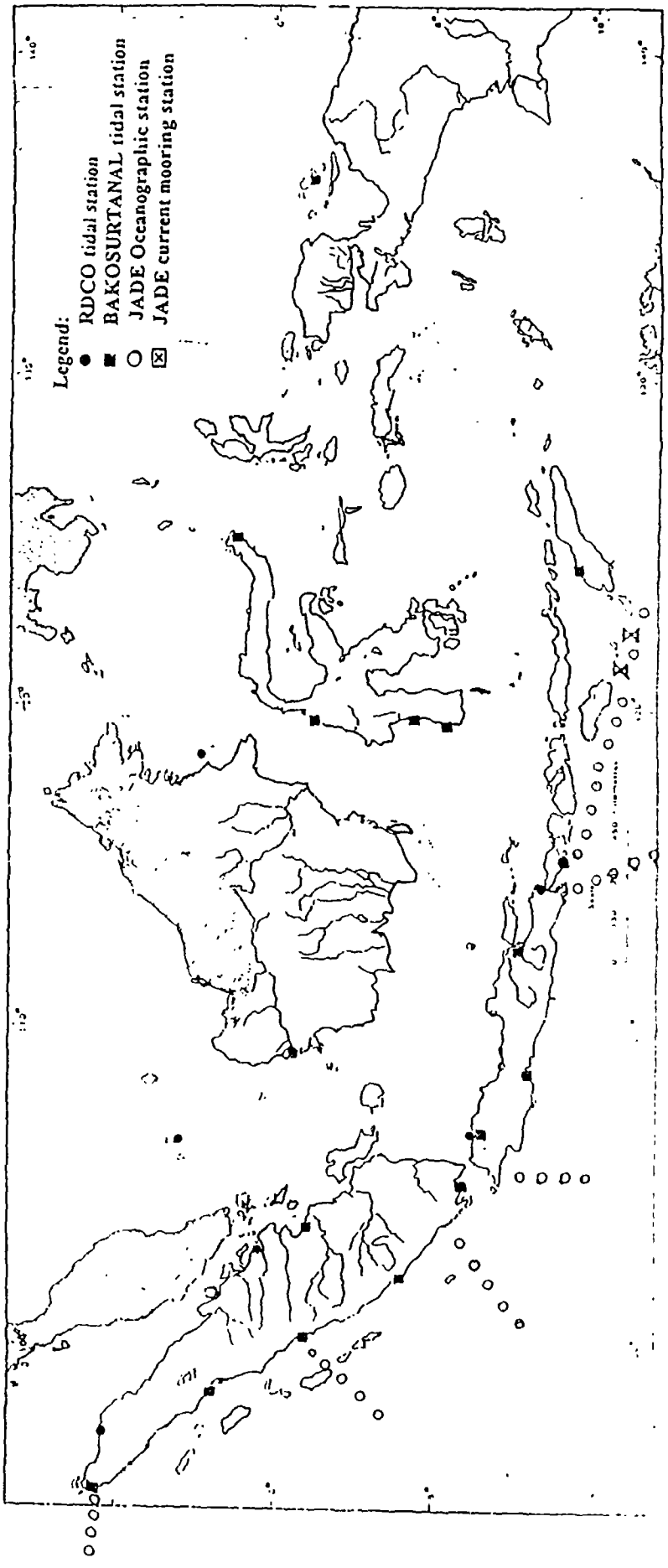


Figure 1. Tide Station and JADE Cruise track

Table 3. Active Tidal Stations in Indonesia.

| No. | Location | Start of Operation | Operating Agency |
|---|---|---|---|
| | ASEAN-Australia | | |
| 1 | Lhok Seumawe | th 1987 | RDCO and DISHIDROS |
| 2 | Pasir Panjang | th 1987 | idem |
| 3 | Tarempa | th 1987 | idem |
| 4 | Pontianak | th 1987 | idem |
| 5 | Pulau Pari | th 1987 | idem |
| 6 | Meneng | th 1987 | idem |
| 7 | Tarakan | th 1987 | idem |
| | | | |
| | Other Projects | | |
| 1 | Surabaya | th 1980 | BAKOSURTANAL and TOGA |
| 2 | Cilacap | th 1980 | idem |
| 3 | Teluk Bayur | th 1989 | idem |
| 4 | Bitung | th 1989 | idem |
| 5 | Benoa | th 1984 | idem |
| 6 | Panjang | th 1989 | BAKOSURTANAL |
| 7 | Ujung Pandang | th 1989 | idem |
| 8 | Sibolga | th 1989 | idem |
| 9 | Palopo | th 1989 | idem |
| 10 | Malahayati | th 1989 | idem |
| 11 | Dumai | th 1990 | idem |
| 12 | Bengkulu | th 1989 | idem |
| 13 | Mamuju | th 1989 | idem |
| 14 | Tanujung Priok | th 1991 | idem |
| 15 | Biak | th 1991 | idem |
| 16 | Kupang | th 1991 | idem |

See Fig. 1.

### 3.1.2 Meteorological studies

In the field of meteorology BMG (the Meteorological and Geophysical Agency) in the national level responsible of the management, evaluation and execution of meteorological studies The BMG provides meteorological informations and services adapted to the requirements for aeronautics, maritime, agriculture and other sectors of the national development activities. In

the international bodies, researches of atmosphere and ocean are executed by scientists from institutes such as BMG, LAPAN, BPPT, RDCO, BAKOSURTANAL and some Universities.

Several meteorological observation stations were provided in connection with the coontribution of Indonesia to World Weather Watch (WWW) Programme and to meet the requirement of National Programme. At present the observation station network comprises of:

112 synoptic stations (60 basic, 52 nonbasic),
65 upper air stations (13 radiosonde, 6 rawin and pilot balloon),
16 general climatological stations,
89 special climatological stations,
157 evaporation stations,
4609 rainfall stations.

The basic synoptic stations are now available for operating 24 hours a day; one or two times for 0000 GMT and 1200 GMT. Rason and/or rawin observations are carried out at the upper air stations.

Twenty to thirty sea weather data a day are received from ships observation sailing in the Indoneisan waters and its surrounding. The data was analized as an aid for prepairing the daily weather forecasting and seasonal forecasting. Data was compiled in the disket formal.

Three telecommunication systems are used in meteorology and they are the Aeronautical purposes. It is under controlled by the Directorate General of Air Communications; the public telecommunications under controlled by the Directorate General of Telecommunications and the special meteorological telecommunication network under controlled by the Meteorological and Geophysical Agency (BMG).

The latter comprises of three subsystems namely first the regional telecommunications subsystem for regional data collecting and dessiminating using Radio Single Side Band (SSB). Data from stations in a region are collected at Subregional and at the Regional Centre. The second subsystem is interregional telex subsystem used for data exchanges from/to Subregional Centre, Subcentre and National Centre, Jakarta using 50 bps channel capacity, and the third subsystem is the international telex subsystem for data exchanges with other meteorological centre in international scope as a link to Global Telecommunica- tion System (GTS) (Jakarta-Singapore and Jakarta-Melbourne). The capacity of this channel has been increased from 75 bps to 9600 bps. The other data dessimination system is the broadcast system operating on usual radio frequency.

Mainframe computer DPS-7000 being installed as an upgrading of the old existing computer CII-HB 64/60. For computing the climatological data the CLICOM system will be installed and will be developed. Every month CLIMAT massages from local stations are sent to WWW in the form of hardcopy. Starting from November 1990 the massages also sent using the GTS link.

Data and meteorological informations are now widely used in many purposes in Indonesia. Daily weather forecast is provided for aviation and marine activities, and for public information. Long range and seasonal forecast is also required particularly dynamical forecasting including the use of ENSO data and the numerical weather predicting modelling are currently being developed.

3.2 Future programmes

3.2.1 Oceanography

1). Tides and Tidal Phenomena

The ASEAN-Australia project on tides will be continued up to the year 1994. Furthermore this programme will be extended to current metering project. Four current meters moorings will be installed in the Malacca Strait, Singapore Strait, South China Sea and the Makassar Strait. ASEAN and Australian researcch ships will be used in the Current metering. ADCP Acoustic Doppler Current Profiler) will be also be operated on board these ships to complement the current mooring. CTD casting will also be made on the cruises.

Tidal stations operation of BAKOSURTANAL will be continued at least up to the end of this century.

DISHIDROS and the State Minister for Population and Environment plan to install twelve additional tide study of global sea level rise and the ARLINDO.

2). JADE Programme.

The Franco-Indonesian cooperation in JADE (JAVA-Australia Dynamic Experiment) will be continued in February 1992. The same number of oceanographic stations as in JADE 89, 90 in the Indian Ocean between Java-Sumatra and Australia will be occupied. Both the RV "Marion Dufresne" and the "Baruna Jaya I" will be used. CTD and ADCP will be operated by both ships.

The cruises of the two ships will be complemented with moored current meter observation and tidal gauges operation. The location of current meter will be increased from two in JADE 90 to 4 locations in JADE 92, each of them will be installed in the Lombok Strait, Alas Strait, Sawu Sea, Roti Strait, all situated will be installed in these channels, to monitor the relationship of the strength and variability of ARLINDO with the sea level height in the channels.

3). US-Indonesian Cooperation in Oceanic and Atmospheric Sciences.

The US and Indonesian Governments at present are still discussing the possibility of cooperations in oceanic and atmospheric sciences to be carried out in Indonesian waters

The research programme and the participating universities and agencies will be coordinated by BPPT in the Indonesian side and by NOAA in the US Side.

The field of study to be included in this cooperation are:
Topic 1 : Study on Sea Level changes in the Indonesian Waters.
Topic 2 : Study on the Indonesian Ocean Circulation.
Topic3 : Study on the Climate Variability using Wind Profiling Radar.
Topic 4 : Study on the Ocean-Atmospheric Interaction.
Topic 5 : Climate computing.
Topic 6 : Monitoring Air Chemical Composition.
Topic 7 : Environmental Pollution Control.

Under this arrangement RDCO is at present seeking cooperation with the Lamont Doherty Geological Observatory, Columbia University to implement Topic 2, with the special objective of studying the ARLINDO and its effect on the water mass characteristics and vice versa.

4). XBT casting by ships of opportunity.

Plan is being set up to make XBT-lines of cross-sections within the Indonesian seas with the help of PELNI (National Indonesian Shipping Company) who now operates 8 new large passenger ships connecting about 30 Indonesian ports throughout the archipelago. At least five XBT lines are envisioned :

1. Jakarta - Medan
2. Jakarta - Padang
3. Jakarta - Ujung Pandang - Bitung
4. Jakarta - Sorong
5. Jakarta - Kupang
6. Ambon - Kupang
7. Bitung - Biak

The objective is to monitor the SST (sea surface temperature) anomaly, SSP (sea surface (air) pressure) and the DOT (depth of thermocline). These data is useful to promote capability of predicting the occurrence of long draught in Indonesia in relation to the EL-Nino.

### 3.2.2 Meteorology

BMG will continue its present programme and services. It is also expected that the data from the meteorological observing stations described earlier and from other stations will also contribute to WMO and TOGA programmes. For the purpose of TOGA data exchanges the GTS link Jakarta-Singapore and Jakarta-Melbourne will be of great help to provide means of communication.

In the atmosphere research activities, a joint research will be carried out by LAPAN (National Space and Aeronautics Institute) and NOAA. Wind profiling radar will be installed at Biak in the late 1991. Other cooperation being planned by LAPAN is that with the Kyoto University in Japan to study the Kelvin wave and the Rossby Gravity wave, among others through the use of radiosonde observation, wind finding radar and boundary layer radar. All of these equipments is expected to be completely installed in Surabaya and Bandung by 1992 or 1993

BMG and LAPAN also plan to analiyze the SST and cloud Coverage data in their possession. These data is in the form of APT (automatic picture transmission) images received from NOAA's sattelite is expected to help the monitoring and predicting works for long draught done by other means.

# 4. OCEANOGRAPHIC DATA MANAGEMENT AT RDCO

## 4.1 Data management

The data managed by RDCO can be divided into four major components i.e: oceanographic cruise data, tidal data, marine pollution data and marine biological data

### 4.1.1 Oceanographic cruise data

Sincce 1969 around 50 cruises has been carried out in order to collect oceanographic data in Indonesian waters. The number of stations taken from that cruises were about 1640. To manage this data, RDCO has developed a PC-based information system. The system used is dBase III plus software for archieving data and some software package for data analysis.

Data managed by RDCO marely come from the cruises by this institute. The oceanographic cruise data cousite of :

- Marine Meteorological Data
- Physical Oceanographic Data
- Chemical Oceanographic Data
- Biological Oceanographic Data

The recent oceanographic cruises database causes of data collected by R.V. Baruna Jaya, A new oceanographic research vessel launched in 1989. A total of 9 cruises have been complited with total number of stations are 297 stations (Figure 2). Meanwhile, the data collected from 1969 is still in quality control process.

### 4.1.2 Tidal data

This data was collected from seven locations in the western Indonesian Archipelago (Figure 2). These tidal station have been operated since 1987 and will be continued up to the year 1994. The data recorded by ENDECO and LS-A 71 instruments in hourly height. The data was sent to ASEAN Tidal Data Bank at the Flinders University of South Australia (FUSA). Transcription of tidal data from the cartridge recorded by ENDECO tide gauges has been carried out regularly. Similary digitizing of the analogous recorded by LS-A71 instruments has also been carried out. Since February 1992, RDCO has developed a new software to edit the tidal data. The software was written in Fortran by Dr. Dharma Arif and serves many purposes, such as transcription of tidal data from the cartridge into the PC, gaps interpolation, forming data of consecutive months, determining trend of sea level data and plotting of the data. It is also designed to identify and to correct interactively doubtful data, any deviation and shifting in data. The software is called EDIT386 and still being developed to accomodate more entries in data processing.

### 4.1.3 Marine Biological Data (Coastal Living Resources)

Marine biological resources data is the results of biosystematic study of marine flora and fauna of Indonesian waters. At present a Coastal Living Resources database system has been developed at RDCO. This database is a standard database system for Coastal Living

Resources Study among ASEAN Countries. The database was developed under ASEAN-Australia Cooperative Project on Marine Science. The data managed consist of four coastal living resources components i.e:

- Coral reef ecosystem data
- Mangrove ecosystem data
- Seagrass ecosystem data
- Softbottom community data

The Indonesia coastal living resources data was collected since 1987 from three areas i.e Seribu Island; a coral reef archipelago of Jakarta Bay, Ujung Kulon in West Java and Grajagan in east Java. Number of records which has been stored into databasee are around 70.000 records. This data is considered to be important for assessing the impact of global climate change on coastal living resources. UNEP has adapted the methodology of coastal living resources assessment developed by this project for the purpose of developing global monitoring.

#### 4.1.4 Marine Pollution Data

Marine pollution data was collected in order to monitor the environmental condition of Indonesian waters especially in the coastal areas. The pollution is generally caused by land based human activities. The parameters of marine pollution to be monitored can be categorized into physical, chemical and microbiological parameters pollution station amount to 2055 station and all of the data has been stored in floppy disk.

### 4.2 Hardware and Software

Data management activities were supported by several hardwares and softwares. Presently, the hardware used are :

- four PCs AT/386 with harddisk
- one unit microvax II with two terminals
- one plotter (HP Draftmaster)
- some printer (dat matrix and laser jet)

The software used are Datatrieve for Microvax system and software programs for PCs.

### 4.3 Personnel

To support the data management activities, RDCO employed personels with the following specification :

1. MIS specialist
2. programmer
3. data entry operator

With the increasing number of data and type of activities it seems that the number of personnels mentioned above was not enough to support RDCO activities.

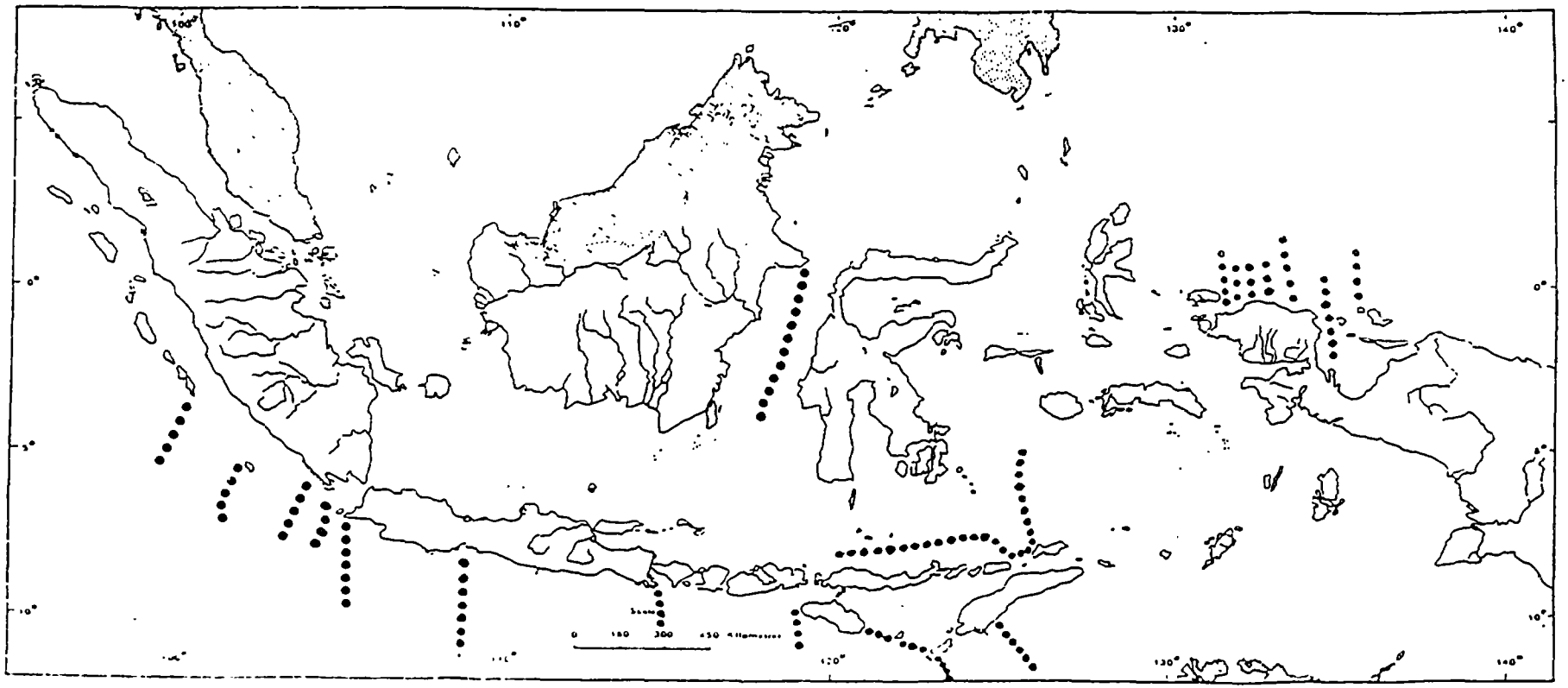

Figure 2. Baruna Jaya Cruise Track 1990 - 1991.

## 5. SOME CONSIDERATIONS on the DEVELOPMENT of IMDC

The establishment of marine science data centre in Indonesia is one of the difficult undertaken and organized in the country. Many institutions have established their own data management systems. In the case of climate change study, it has been concensused by National Committe that for climate data, a centre will be established in the Meteorology and Geophysics Agency and a subcentre for tide data will be established in Naval Hydrographic Office. However, RDCO has developed an Oceanographic Data Centre which include collecting and managing physical, chemical and biological oceanographic data, coastal living resources data and marine pollution data

To establish data centre at national level, it is important to consider the following aspects :

1. Technical capability
2. Human Resources
3. Hardware and Software

The main constraint to face these problems is limited budget from the government. Some cooperative project has been made by RDCO such as ASEAN-Australia Project, ASEAN-Canada and others. But these kind of cooperative project mostly was not emphasize on the management of information.

A general problem arises in data processing organization is the lack of trained personnel. Working in the private sector is more atractive because it offer much better income in the governmental organization. The best way to solve the problem is to train the existing personel either inside the country or abroad.

Hardware and software should follow the need of data processing activities and the development of organization. It is important to note that the hardware not necessary expensive but it can accommodate all the management activities.

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NATIONAL REPORT OF IRELAND

Recent Initiatives in Irish National Marine Data Management

## Introduction

While it is widely recognised that advances in marine science and technology depend on the mobilisation and flow of information, Ireland currently has no coordinated national marine data management policy. However, provision has been made, within the EC STRIDE Operational Programme for Ireland, for the establishment of a Irish National Marine Data and Referral Centre. Phase I of the project, "the Feasibility Study" is now complete and it is expected that Phase II, "the Implementation of Proposals" will begin shortly. A summary of Phase I is described below.

The report produced in Phase I of this project has two objectives :

- to provide the national authorities with the background information on establishing, developing and operating a Marine Data Centre
- to provide an outline of the recommended steps for the start-up phase and long-term strategies.

This study involved three main activities :

- assimilation of background information
- evaluation of alternatives
- proposed implementation plan for the recommended centre.

## Background

The gathering of background information involved a review of existing literature, a survey of marine data users in Ireland and a review of operational procedures at a number of established National Oceanographic Data Centres.

The Irish edition of the European Directory of Marine Environmental Data (EDMED), compiled jointly by EOLAS and the British Oceanographic Data Centre (BODC) was very useful in providing an overall picture of marine data users in Ireland. While the directory is effective as a quick reference system for broadly described marine data sets in Ireland, it was not intended, nor is it considered to be an effective total data management solution. The Irish edition of EDMED has two limitations :

- data sets are often described with insufficient detail to assess volume, location and quality
- the onus of data management remains solely with the data collector and this has generally been found to be unsatisfactory.

Our analysis of EDMED has established that the majority of data collection in Ireland is funded, directly or indirectly, by the public sector. A diverse range of data types are collected and much of these data are freely available.

Interviews were conducted with a cross-section of the Irish marine data users (35 participants). The survey established the following key points:

- all participants, as secondary users, have a requirement for marine data.

- the majority of participants (70%) are willing to contribute their data to a centre with little or no restrictions
- the majority of participants (75%) indicated that the volume of data generated by themselves was increasing
- over 90% of participants in the survey agreed that a data centre of some form would benefit marine science in Ireland
- the majority of participants (88%) indicated a preference for a data banking centre over a data referral centre.

The four operational Oceanographic Data Centres visited were:

- the International Council for the Exploration of the Sea (ICES)
- the British Oceanographic Data Centre (BODC)
- the Deutsches Ozeanographisches Datenzentrum (DOD)
- the Marine Information Service (MARIS), the Netherlands .

It was found that :

1. Provision of sufficient resources is considered fundamental to the success of a data management centre. No centre generated more than 5% of its annual budget directly from its activities in national marine data management.
2. Developing a good relationship between the marine science community and the team operating the data centre, is considered to be crucial to the centres success.
3. There is clearly a strong commitment, throughout Europe, to marine data management.
4. Although the type of service offered by three of the four centres is similar, there appears to be no common standard for data management systems.
5. Countries with a developed data banking centre appear to have a higher level of data exchange than countries without such a service.

## Alternatives

Five alternative models for establishing a National Marine Data Management Centre were considered

1. One person with a PC computer, located within an existing marine research organisation, who would be dedicated to data management.
2. A centre that would maintain a source referral database for all Irish marine data, but would not bank any data.
3. A centre that would maintain a source referral database for all Irish marine data and would also bank key data sets (including quality control).
4. A centre that would bank and quality control all available marine data sets.
5. A distributed service, where a network of mini-centres would be established within a number of key marine organisations. These mini-centres would be responsible for national data management of specific data types. This type of operation would also involve establishing a controlling centre

banking centre) is recommended as the most suitable option for meeting the requirements of the Irish marine science community.

It is suggested that the centre be funded primarily by government, with a small amount (approximately 5% of operating budget) being generated from customer receipts and data products.

In view of the potential for inter-agency friction and the goal of promoting better relationships between the centre and its users, it is recommended that every effort should be made to establish the centre as an autonomous unit. However, consideration must also be given to proximity of expertise.

The data centre will support the operations (in terms of data management) of the Research Vessel, Lough Beltra, which is being upgraded under measure 3 of the EC STRIDE operational programme.

## Implementation

The proposed implementation plan involves intense activity, primarily in systems development, for 21 months, by which time, the centre will have begun banking 'key' data types, the referral database will be operational and the Lough Beltra data management system will be operational.

The centre, during the start-up phase (21 months) will employ nine staff, reducing to five during the development phase.

# NATIONAL REPORT OF JAPAN

**Report on Intersessional Activities in Japan**

## 1. PREFACE

As the entire activity of the Japan Oceanographic Data Center (JODC) spreads too vastly, this report describes only the areas where substantial progresses was made during the past intersessional period. These progresses have been made in the area of information management, data collection, and information dissemination.

## 2. NATIONAL ACTIVITIES

### 2.1 PRINCIPLE POLICY & STRATEGY OF JODC DURING THE PAST INTERSESSIONAL PERIOD

JODC set its operational policy toward the direction established by IODE XIII and other intersessional meetings such as the Data Archaeology Workshop, GTSPP meetings, WOCE DMCs, the Ocean Climate Data Workshop, GE/RCDS & GE/TADE. Personnel exchange with colleague data centers such as MEDS, AODC, CNODC, US NODC & NGDC proved that the exchange of ideas, information, and knowledge is the most effective way to co-operatively pursue international business both in administration and in technique.

As for the global climate studies, JODC has been contributing as the information center as well as the national data source, for those Japanese contributions to WOCE & JGOFS programmes.

### 2.2 MARINE INFORMATION MANAGEMENT

Marine information management at JODC has progressed greatly during the past intersessional period. The first to come is the Regional Marine Information Management System. With the cooperation of local governments, JODC has dug up any kind of marine related publications. The information obtained is stored in digital, and strategically designed DOS-based software was prepared for the convenience of users. The software makes itself a great reward for the contributors. The other progress is the development of JODC Library Management System. The library has collected more the twenty thousands of publication, all of which were collected at the exchange basis. The MacIntosh-based software provides superb environment to the library users.

### 2.3 IMPROVEMENT IN DATA COLLECTION

The first priority was put on the data collection. Three strategies were set for improved data collection. The first was to recognize and understand the contributors' requirement, that is to be friendly to them. The second was a rewarding mechanism. The third was the information management. As one of the results, the Fishery Agency of Japan (JFA) changed its attitude on data sharing policy and started donation of data to JODC in digital. In the donation, 295,915 casts of bottle data, 99,925 BTs and 29,808 GEKs ranging for twenty years were included. The negotiation for the next step is underway with JFA that JODC will take over their data management entirely, which will promise the perfect collection of JFA data at the earliest availability. Other data archaeology effort discovered more than some one hundred of cartridge tapes containing CTD data never open to public.

### 2.4 IMPROVED INFORMATION DISSEMINATION - JOIDES

Rewarding by tasty products and service has proved itself to be the most effective and efficient incentive. One of these strategic services is JOIDES, JODC On-line Information and Data Exchange Service. JOIDES is a dedicated telemail and electronic bulletin board service system (BBS) for oceanographers, at free of charge. JODC started its operation from May 1991. BBSs prepared in JOIDES include Announcement and Information from JODC, NOP, ROSCOP, Dictionary of Abbreviations and Acronyms, Project News from J-WOCE, J-JGOFS, JEXAM, TOPEX/POSEIDON, etc.

JOIDES has improved the accessibility to Japanese ocean scientists drastically by providing special JOIDES account, which enables to send and receive mails with Telemail system, such as OMNET, for free. The system was awarded the Superb Information System of the Year 1992, as it assisted Japanese contribution to the global climate programmes with the improved information environment.

Colleague NODCs, DNAs, and other data managers are welcome to obtain its account for JOIDES from JODC. JOIDES is internationally accessible from many countries at a minimal cost of local call only.

## 3. INTERNATIONAL ACTIVITIES

### 3.1 WESTPAC DATA MANAGEMENT TRAINING COURSE

Three training courses were held during the past intersessional period. Emphasis is placed on the recent data management technologies such as high performance PCs with GUI, CD-ROMs, and telemail. Eleven trainees from Indonesia, Korea, Malaysia, Philippines, Thailand, and Vietnam participated in the Course.

### 3.2 ON-LINE DATA TRANSFER TO MEDS

Since July 1988, upper ocean thermal data has been sent from JODC to IOS, Canada and SIO, US under tri-lateral agreement. As JOIDES became available, data flow from JODC to IOS was changed from MT basis to on-line basis, through MEDS computer. After several-month experiment, the on-line transfer started from August 1991. This data transfer method may be applicable to any data center.

### 3.3 INTERNATIONAL WORKSHOP ON OCEANOGRAPHIC DATA MANAGEMENT & EXCHANGE

The IOC-JODC International Workshop on Oceanographic Data Management and Exchange is held at JODC, 10-13 November 1992. The purpose of the Workshop is to strengthen the national data center activities at western Pacific and Indian Ocean countries, by recognizing the roles and the importance of NODCs for the large scale studies such as global climate change programmes and coming GOOS, by identifying the existing problems on the activities of NODC in each country and by discussing the possible support plans for the strengthening of these NODCs. Data managers from India, Indonesia, Japan, Korea, Malaysia, Philippines, Russia, Thailand, USA & Vietnam, ocean researchers and scientists in Japan, and the Secretary of IODE are participating.

# NATIONAL REPORT OF THE REPUBLIC OF KOREA

## Status of National Data Management & Problems in Korea

In recognition of the pressing societal need to understand the Korean climate system as well as the global system and the potential for human impact on that system, there is wide interest in greatly expanding our capabilities to monitor the seas around Korea. In response to this, Korea Oceanographic Data Center (KODC) has full responsibility to exchange data in and out of Korea.

We are handling bi-monthly oceanographic data around Korean Waters, mainly 33° N - 38° N and 124° E - 132° E to make time series since 1917, daily SST data at coastal observation stations since 1916, monthly mean sea level data since 1960, six hourly NOAA Series raw data since 1990 covering the area 25° N - 45° N, and 120° E - 140° E, and daily SST charts analyzed from AVHRR data directly received by HRPT of NOAA series satellites since 1990.

Most data are stored in magnetic tape. However, some of them, such as bi-monthly oceanographic data at 175 stations from 1961 to 1991 and monthly mean sea level data at 22 tide stations from 1960 to 1991, are also in high density disc for personal computer use. These are subject to serve on written request of user.

SST charts are being distributed via fax near real time base to fisheries communities. Weekly and monthly oceanographic data are also distributed to fisheries groups as periodicals. Annual data are in Annual Reports published by data producing organizations and they are widely distributed to research groups. KODC Newsletter is published twice a year.

The seas around Korea are marginal seas an we need more effective regional cooperations for data exchange under IODE umbrella. Marginal sea, such as the Yellow Sea and the Orient Sea (Sea of Japan), has her own characteristics, and we expect to establish regional cooperation committee for effective data exchange among surrounded nations including interested nations. This regional committee is not only regional cooperation body but also international cooperation body.

Table 1. Number of the observation data for 1921-1990 at 5 stations in the Western Channel of the Korea Strait

| Year \ Month | Jan. | Feb. | Mar. | Apr. | May | Jun. | Jul. | Aug. | Sep. | Oct. | Nov. | Dec. | No. of Year | Observation Organization |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1921 | | | | | | | | | | | ○ | | 1 | Fisheries |
| 22 | | | | | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | 8 | Experiment |
| 23 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | 12 | Station, Korea |
| 24 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | 12 | |
| 25 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | 12 | |
| 26 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | 12 | |
| 27 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | 12 | |
| 28 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | 12 | |
| 29 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | 12 | |
| 30 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | 12 | |
| 1931 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | 12 | |
| 32 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | 12 | |
| 33 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | 12 | |
| 34 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | 12 | |
| 35 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | 12 | |
| 36 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | 12 | |
| 37 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | 12 | |
| 38 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | 12 | |
| 39 | ○ | ○ | ○ | ○ | ○ | | ○ | ○ | ○ | ○ | ○ | | 10 | |
| 40 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | ○ | ○ | ○ | 11 | |
| 1941 | ○ | ○ | | ○ | ○ | ○ | | ○ | ○ | ○ | ○ | | 9 | |
| 42 | | | | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | 8 | |
| 43 | ○ | | ○ | ○ | ○ | | | ○ | | | | | 5 | |
| 44 | | | | | | | | | | | | | 0 | |
| 45 | | | | | | | | | | | | | 0 | |
| 46 | | | | | | | | | | | ○ | | 1 | Central |
| 47 | | | | | | | | ○ | | | | | 1 | Fisheries |
| 48 | | | | | | | | ○ | | | ○ | ○ | 3 | Experiment |
| 49 | | | | ○ | ○ | | ○ | | | | | | 3 | Station, Korea |
| 50 | | | | ○ | | | | | | | | | 1 | |
| 1951 | | | ○ | | | | | | | | | | 1 | |
| 52 | ○ | | | | | ○ | ○ | ○ | ○ | ○ | | ○ | 7 | |
| 53 | ○ | ○ | ○ | | ○ | | | | | ○ | | ○ | 6 | |
| 54 | | | | ○ | | | ○ | | ○ | | ○ | ○ | 5 | |
| 55 | ○ | ○ | ○ | | ○ | | ○ | ○ | ○ | ○ | ○ | | 9 | |
| 56 | ○ | ○ | | | ○ | ○ | ○ | | ○ | ○ | ○ | ○ | 9 | |
| 57 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | 12 | |
| 58 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | 12 | |
| 59 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | 12 | |
| 60 | ○ | ○ | ○ | ○ | | ○ | | | | | ○ | | 6 | |

Table 1. Continued

| Month / Year | Jan. | Feb. | Mar. | Apr. | May | Jun. | Jul. | Aug. | Sep. | Oct. | Nov. | Dec. | No. of Year | Observation Organization |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1961 | ○ | | ○ | | | ○ | ○ | ○ | | ○ | ○ | ○ | 8 | |
| 62 | ○ | | ○ | ○ | ○ | ○ | ○ | | | ○ | ○ | ○ | 9 | |
| 63 | | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | | | ○ | 8 | National |
| 64 | | | | ○ | ○ | | ○ | ○ | ○ | ○ | ○ | ○ | 8 | Fisheries |
| 65 | ○ | | ○ | | ○ | ○ | | ○ | ○ | ○ | ○ | ○ | 9 | Research & |
| 66 | | | ○ | | ○ | ○ | ○ | | | | ○ | | 5 | Development |
| 67 | ○ | | ○ | | ○ | ○ | | ○ | | ○ | ○ | | 7 | Agency, Korea |
| 68 | ○ | ○ | | ○ | | ○ | ○ | ○ | ○ | ○ | ○ | ○ | 10 | |
| 69 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | 12 | |
| 70 | | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | ○ | 10 | |
| 1971 | | ○ | | ○ | ○ | ○ | ○ | ○ | | ○ | | ○ | 8 | |
| 72 | | ○ | | ○ | | ○ | | ○ | | ○ | | ○ | 6 | |
| 73 | | ○ | | ○ | | ○ | | ○ | | ○ | | ○ | 6 | |
| 74 | | ○ | | | ○ | ○ | | ○ | | ○ | | ○ | 6 | |
| 75 | | ○ | | ○ | | ○ | | ○ | | ○ | | ○ | 6 | |
| 76 | | ○ | | ○ | | ○ | | | ○ | ○ | | ○ | 6 | |
| 77 | | ○ | | ○ | | ○ | | ○ | | ○ | | ○ | 6 | |
| 78 | | ○ | | ○ | | ○ | | ○ | | ○ | | ○ | 6 | |
| 79 | | ○ | | ○ | | ○ | | ○ | | ○ | | ○ | 6 | |
| 80 | | ○ | | ○ | | ○ | | ○ | ○ | ○ | | ○ | 7 | |
| 1881 | | ○ | | ○ | | ○ | | ○ | | ○ | | ○ | 6 | |
| 82 | | ○ | | ○ | | ○ | | ○ | | ○ | | ○ | 6 | |
| 83 | | ○ | | ○ | | ○ | | ○ | | ○ | | ○ | 6 | |
| 84 | | ○ | | ○ | | ○ | | ○ | | ○ | | ○ | 6 | |
| 85 | | ○ | | ○ | | ○ | | ○ | | ○ | | ○ | 6 | |
| 86 | | ○ | | ○ | | ○ | | ○ | | ○ | | ○ | 6 | |
| 87 | | ○ | | ○ | | ○ | | ○ | | ○ | | ○ | 6 | |
| 88 | | ○ | | ○ | | ○ | | ○ | | ○ | | ○ | 6 | |
| 89 | | ○ | | ○ | | ○ | | ○ | | ○ | | | 5 | |
| 90 | | ○ | | ○ | | ○ | | ○ | | ○ | | ○ | 6 | |
| No. of Years | 35 | 50 | 34 | 55 | 40 | 57 | 37 | 59 | 34 | 58 | 41 | 55 | 555 | |

This report makes an attempt to give a vision of how an existing international oceanographic data & information exchange system might evolve & proposes a strategy for future actions. That strategy is to be built on the success of the current data centre's infrastructure to achieve a data & information system in support of the Global Climate Change Programme. The need to involve the scientific community at all stages of development & operation of the data system is emphasized.

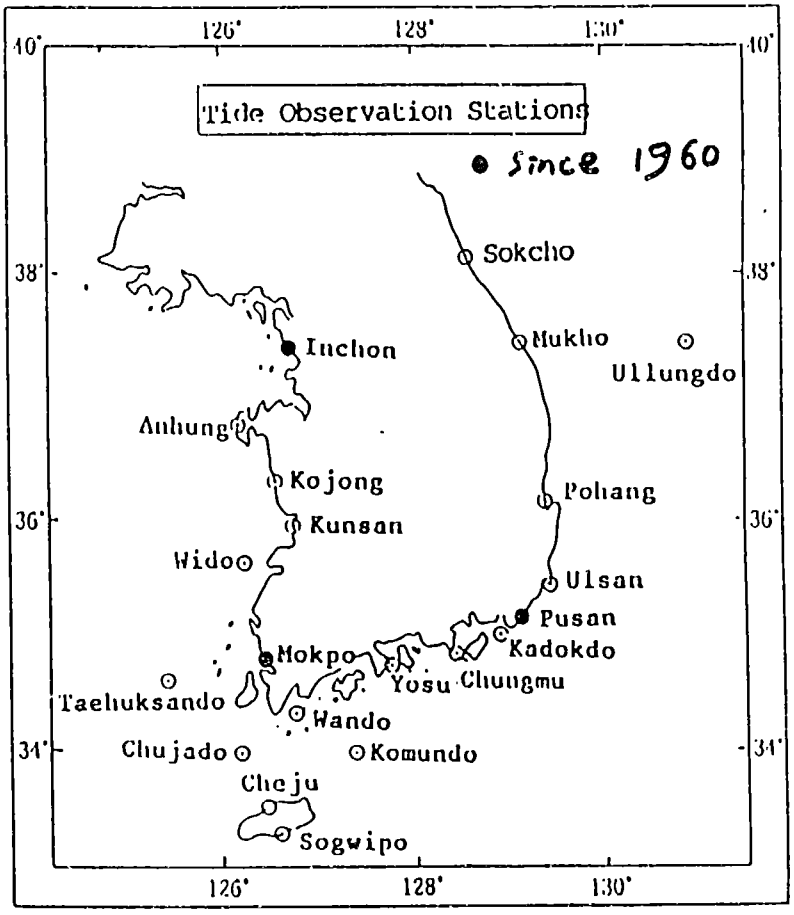



Fig. 3. Location map of tide observation stations surveyed by the Office of Hydrographic Affairs.

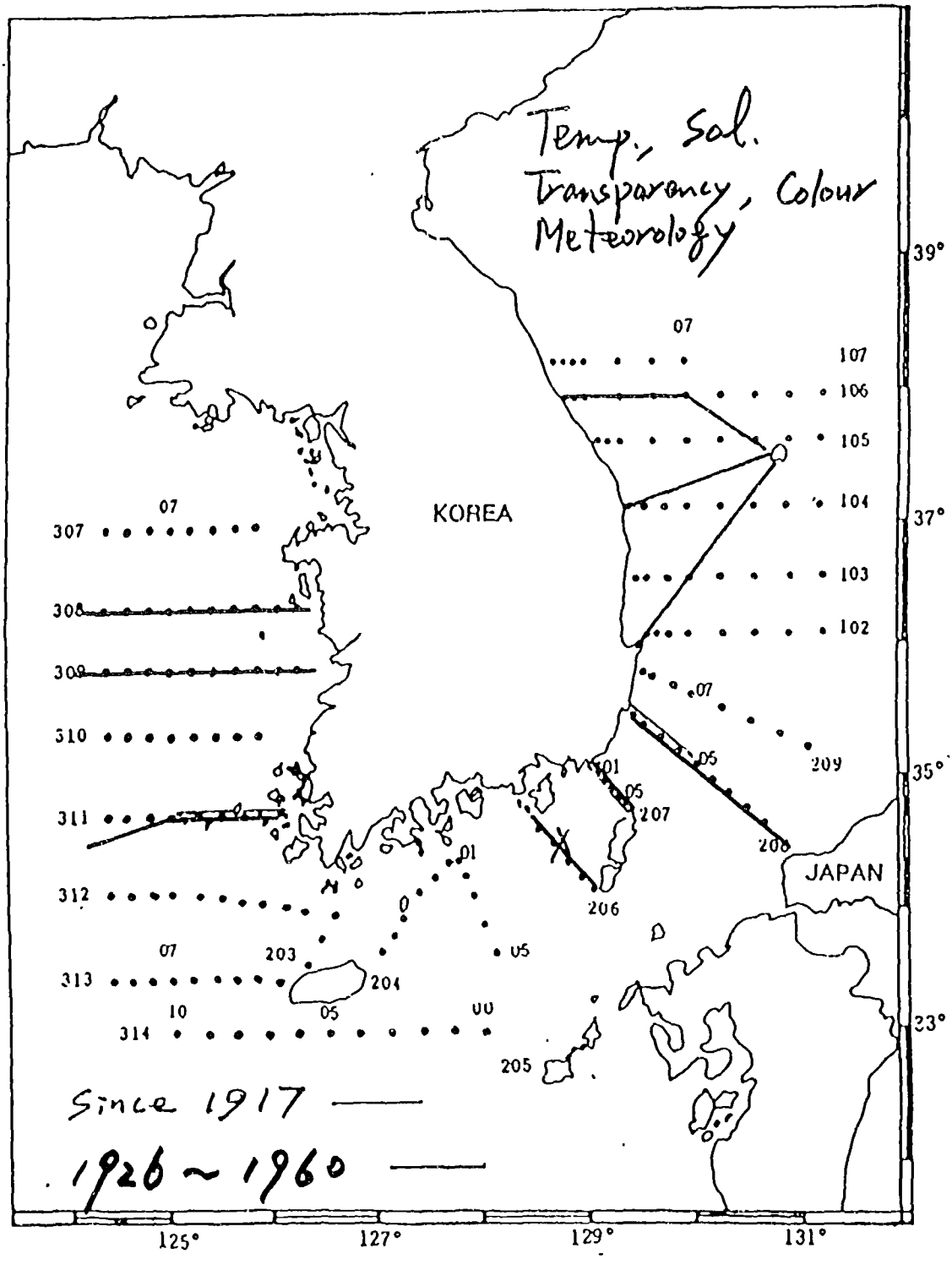



Fig. 1. Location map of the serial Oceanographic observation stations surveyed by the National Fisheries Research and Development Agency.

1. Status of the Global Data Exchange

(1) NOPs to IOC annually since 1981.

(2) ROSCOP and TESAC to RNODC-WESTPAC(JODC) bi-monthly since 1984.

(3) P.C. available Floppy Disc data to RNODC-WESTPAC(JODC) and WDC-A(U.S. NODC) on request.

(4) KODC Newsletter since 1990.

(5) Annual Report of Oceanographic Observations since 1974.

2. Participation in Global Ocean Climate Projects

(1) IOC-WESTPAC

(2) IOC-MEDI

(3) IOC-INFOCLIMA

(4) WOCE-DMC

3. GOOS Development

(1) Bi-monthly oceanographic observations around Korean Waters mainly 33° N~38° N and 124° E~132° E to make time series data since 1961 at 175 stations.

(2) Daily SST observations at 81 coastal observation stations.

(3) Hourly sea level observations at 21 coastal tide observation stations.

4. Products and Services

(1) KODC Newsletter, semi-annual since 1983

(2) Annual Report of Oceanographic Observations, since 1952.

(3) Daily SST Chart : Facsimile service since 1990 for near real time base.

(4) Weekly oceanographic forecasting : Mail service since 1926.

(5) Monthly oceanographic forecasting : Mail service since 1952

(6) Oceanographic Table(mean values for temperature, salinity and dissolved oxygen) in Korean Waters (Published in 1979).

(7) Oceanographic Atlas in Korean Waters(Published in 1986).

5. New Data Types

(1) NOAA Series raw data tape : six hourly data since 1990 covered area 25° N~45° N, 120° E~145° E.

(2) Long-time series data of temperature since 1916 to study ocean climate change.

# NATIONAL REPORT FOR MALAYSIA

**International Workshop on Oceanographic Management & Exchange**

## INTRODUCTION

1. Malaysia, by virtue of its long coastal stretches is essentially a maritime nation and the government has expressed its intention of increasing the nation's role in maritime activities for deriving the maximum benefits from the sea areas and the resources therein.

2. With the implementation of the 200 - mile Exclusive Economic Zone (EEZ) under the Law of the Sea Conference and the fast depletion of non-renewable land resources, the government is committed, inter alia, to support the exploitation, management and control of off-shore resources, and the regulation of regional and international navigation in her territorial waters.

## AIM

3. The aim of this paper is to provide information as to the status of development in Malaysia in the field of Oceanography with emphasis on Agencies with concerns and interest in Oceanography and the efforts that are being made to establish a National Oceanographic Data Centre

(2) Drainage and Irrigation Department

Requires marine and oceanographic data over coastal areas for their coastal and estuarine engineering studies and works. These include coastal erosion protection and flood mitigation.

c. Ministry of Defence

(1) Royal Malaysian Navy

The Navy is the national agency responsible for hydrography and bathymetry. It is also concerned with physical oceanography and air/sea interaction processes where these affect sensors and weaponry performance. The Navy is very dependent upon environmental advisory services for effective operations.

d. Ministry of Science, Technology and the Environment (MOSTE)

(1) Headquarters MOSTE

The Headquarters of MOSTE is the administrative body responsible for coordinating the activities of the National Council of Scientific Research and Development and the Marine Science Committee.

LOCAL SCENARIO

4. There are many departments and agencies in Malaysia concerned with oceanographic research, data collection and analyses. It is recognized, as is the case in most countries, that there is an an over-lap of interest between the agencies and that this is unavoidable. It has also been recognized that the only remedy to this situation is to provide a system that would encourage better coordination and collaboration, perhaps in the form of a Oceanographic Centre, whereby these overlaps could be minimized.

5. Ministries, Departments and Agencies which are directly concerned with Oceanography are:

a. Ministry of Transport

(1) Marine Department

Mainly concerned with navigation, marine pollution, hydrography and bathymetry and often dependent upon marine environmental support services

b. Ministry of Agriculture

(1) Fisheries Department

Mainly concerned with marine biology research and related development programmes.

(2) Malaysian Meteorological Services (MMS)

The MMS has set up a section specializing in Marine Meteorological Services. This service includes Marine weather predictions for ship routing, storm warnings and also consultancy services on environmental conditions for coastal and offshore construction. They are responsible for air/sea interaction, data collection (Sea surface data), analyses and the provision of advisory services to mariners.

(3) Department of Environment (DOE)

The DOE is concerned with the collection and analysis of Marine pollutants and requires operational support services in meteorology and oceanography to carry out its anti-pollution programmes. It is responsible the formulation and enforcement of Marine Pollution Regulations.

e. Ministry of Primary Industries

(1) Geological Survey Department

The Geological Survey Department is concerned with seabed and bathymetric

data over coastal areas for their studies of off-shore mineral deposits.

Ministry of Education

(1) Universities

Almost all universities in Malaysia provide courses in Marine Sciences with each specializing in certain fields like Marine Biology and Coastal Engineering.

THE PROBLEMS

6. Diversity. With such a diverse number of agencies being involved in the field of Oceanography, a mechanism should be created to take tab of activities within the country. It is essential that any policy or plan for oceanographic research and operational support services should take into consideration the terms of reference of the foregoing Ministries and Departments so as to safeguard their interests as well as to exploit their expertise to the maximum.

7. Shortage of Observation Platforms. In order to progress research and development projects and to implement analyses and advisory services, it is necessary to establish an adequate input of basic oceanographic data. To achieve this data base, there is a need for considerable expansion in the observing system in terms of dedicated oceanographic ships, oceanographic equipment and remote sensing facilities

8. Availability and exploitation of Data. Oceanographic data which has been collected by government departments and other agencies has traditionally been retained within their respective facilities or, in some cases, destroyed or lost for lack of archiving capabilities.

9. Limited Number of Oceanographers and Technicians. Any expansion of oceanographic services will result in the requirement for a corps of skilled professional oceanographers and technicians. There are a limited number of hydrographers in the Navy, marine biologists, chemists geologists and geophysicists in the universities and government. There are however very few physical oceanographers and personnel trained in this aspect of oceanography who will be required to run the operational support services.

10. Coordinated Research. As each agency is independent of one another, there has been a lack of coordination in research projects often resulting in redundant work and wastage of efforts.

THE NEED

11. The above problems have been addressed within the country through various forums such as the National Marine Science Council, the National Maritime Council and the National Hydrographic Committee. Although the

problem has been recognized, as is the case in many developing countries with many other development projects, there has been much problem trying to give priority to solving this problem especially when there has to be a large outlay of capital with very little, if any, monetary returns to be directly obtained in the short term.

12. However, both the government and the public are slowly but surely coming to recognize the need for oceanographic services and the biggest push has been from the aspect of the environment. The recent spate of accidents in the Malacca Straits goes even further to emphasize the lack of data and coordination in the provision of oceanographic services.

13. With this in mind, the national priorities have been identified and are as follows:

a. Defence.

b. Safety of Navigation.

c. Development, conservation, management and utilization of resources.

d. Protection and preservation of the marine environment.

e. Marine Scientific Research.

14. It has been therefore established that there is a need to establish a good marine data network accompanied by the expansion of services in support of marine operations in coastal waters and the EEZ. There now remains the question of when and how to go about solving the problem.

THE SOLUTION

15. A feasibility study on the above problem was carried out. After having studied the situation and having discussions with several of the agencies that have been previously mentioned, it was found that the best possible approach would be to recommend the establishment of a "Malaysian Oceanographic Research Agency"

16. To be more concrete it recommended that the tasks of the new agency should be:

a. To set up and operate a funding scheme for the purpose of stimulating existing oceanographic research groups.

b. To establish an oceanographic data and information centre.

c. To form a physical oceanography research group.

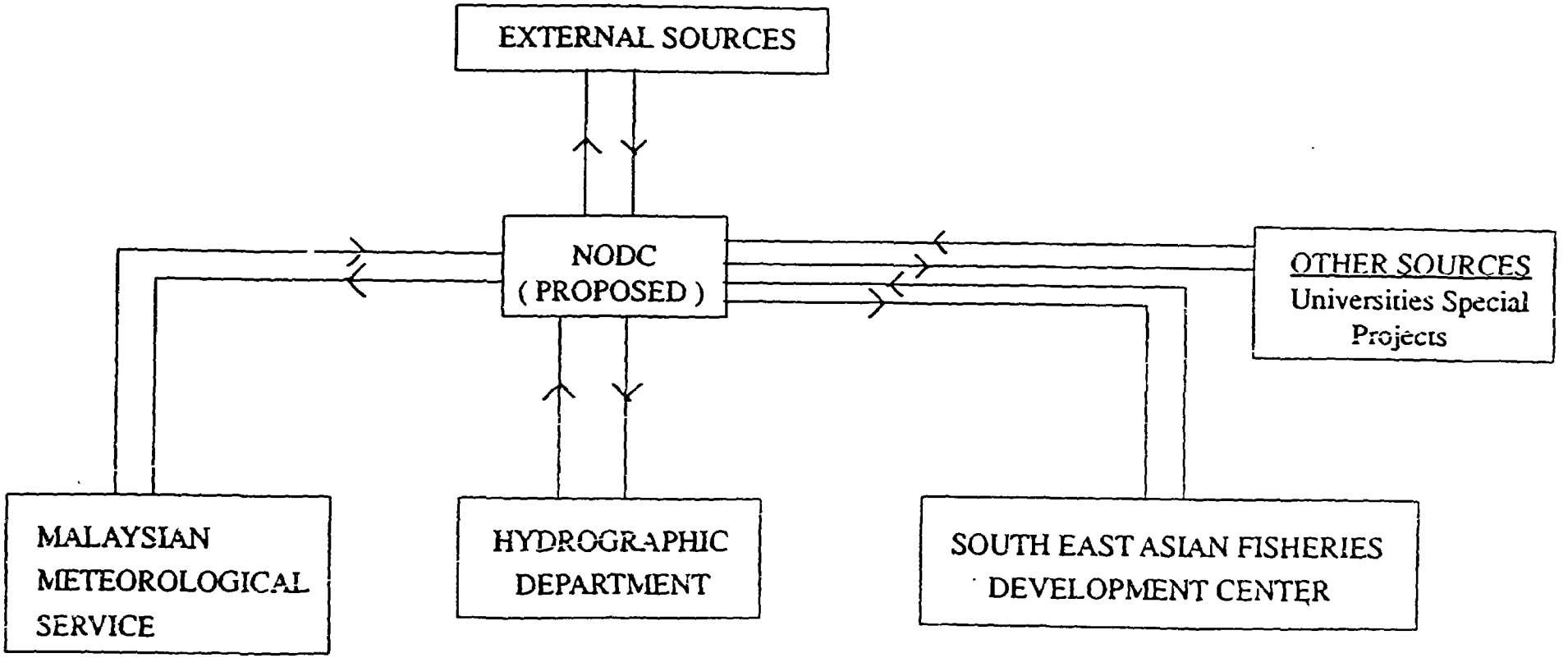
d. To examine the need and possibilities for a dedicated oceanographic research vessel.

CONCLUSION

17. Malaysia has recognized the need of better coordinating and consolidating its efforts in the field of oceanography. Malaysia has also actively participated in many international oceanographic forums and programmes. International cooperation in oceanography is ongoing as can be seen in the case of the ASEAN-Australia , ASEAN-Canada, ASEAN-EC and ASEAN-US ECP's.

18. The formation of a National Oceanographic Research Agency is now being actively pursued and it is also recognized that help from established centres such as the JODC will be very welcome as it would add impetus to its realization.

# PROPOSED DATA FLOW THROUGH NODC



# NATIONAL REPORT OF THE NETHERLANDS

Report of National Oceanographic Activities

## 1. INTRODUCTION

In the Netherlands the Marine Information Service foundation, in short MARIS, acts as national focal point for data, information and expertise on the sea and its usage. MARIS was founded in 1989 by the Netherlands government to improve overview and access of marine data and information.

MARIS develops and exploits various databases with references to available measurement data, research projects, organization profiles, etc. Over the years MARIS has established an extensive and still expanding network of (inter)national data managing organizations, which contribute to these databases. These databases are distributed on disk to interested users. MARIS acts as intermediary and/or broker for data acquisition and can arrange additional processing and analysis of data by mobilizing the expertise of participating contributors. Furthermore MARIS is active in development and transfer of data entry, storage, retrieval and analysis systems, including geographical information systems.

Nowadays MARIS serves an (inter)national community of users, in governmental-, research- and industrial sectors.

Below an overview of MARIS activities will be given, specifically related to the marine research sector.

## 2. MARINE RESEARCH FOUNDATION

MARIS has a contract with the Marine Research Foundation of the Netherlands (SOZ) to maintain overviews of marine research, sea-going cruises and acquired marine data sets within the framework of research activities, sponsored by the Marine Research Foundation.

Under this heading the following activities have been developed:

**Annual reports of sea-going surveys - planned**

These annual reports give an overview of survey and research activities planned per vessel for the coming year. Included are the planning of all vessels, managed and/or operated by scientific institutions and governmental departments in the Netherlands. These reports are issued and distributed (inter)nationally by the Marine Research Foundation to stimulate cooperation and mutual tuning of valuable ship capacities.

Cruise Summary Reports and Reference Databases

For scientific cruises MARIS collects the international cruise summary reports from participating institutes and submits these to ICES and WODC. Furthermore MARIS collects digital and more detailed overviews in MARIS reference-format of the experiments and analyses, deployed during these cruises. These measurement references are combined into PC-databases (or directories), that can be queried using MARIS retrieval software and can be linked with MARIS' geographical mapping package.

Data Registration and Information System - DARIS

MARIS advised the Marine Research Foundation in providing the research vessel 'Ms. Tyro' with a Data Registration and Information System (DARIS). The main objectives of this system are:

- to register and to archive research data, collected during a cruise, in standard formats on behalf of the research community, nationally and internationally,
- to provide researchers on board with computer facilities and computer applications to monitor and to analyze collected data.

As basis framework for DARIS the so-called ABC-system has been adopted. The ABC-system was developed by the Research Vessel Support group (RVS) of the U.K. National Environmental Research Council (NERC) and has been used very satisfactory on NERC's research vessels for years. The same ABC-system has also been adopted as core data system for the research vessel 'Ms. Pelagia' of the Netherlands Institute for Research of the Sea (NIOZ).

The DARIS-system became operational in 1992 and after some test cruises it is presently being used during the Indian Ocean programme of the Marine Research Foundation. DARIS registers the output data of automatic instruments and data from non-automatic instruments/analyses have to be entered by hand by the researchers. Another part of the system involves PC's, workstations and application software, available for the researchers on board to study and exchange acquired data. A module to create MARIS references has been incorporated in DARIS.

## 3. A SYSTEM FOR ANALYSIS OF POLLUTION - ASAP

MARIS can assist - independently and/or by calling in specialists in the field of informatics (monitoring, modelling, geographical information system, analysis), environmental and coastal engineering - in the development and implementation of information systems destined for storage, administration, analysis and presentation of marine data and information.

Information managers, who supply MARIS with overviews of their data holdings, are entitled to free copies of an extensive data entry programme. With this programme one can create documentation databases in MARIS format. For organisations, who do not deliver information to MARIS, the Data Entry & Retrieval software still may be very useful to build an accessible documentation database of their in-house measurement data and objects, including related reports.

The MARIS software has been organised on a multi-purpose basis in order to handle various types of data and disciplines. Features are for instance a comprehensive thesaurus of keywords and a conversion programme for coordinates. However, in practice the user may require alterations or extensions. MARIS can perform these changes on a project basis.

A recent example of adjustment as mentioned above is the ASAP System, which was developed under assignment of the United Nations Environment Programme (UNEP) by Delft Hydraulics in the Netherlands in conjunction with MARIS and BSO/ORIGIN for use in the Arabian Gulf. ASAP stands for "A System for the Analysis of Pollution" and has been put at the disposal of the Regional Organisation for the Protection of the Marine Environment (ROPME) in Kuwait. The system is used to register the various measurements campaigns which take place to ascertain the environmental damage caused by the Gulf War and to keep them surveyable. Pursuantly the system will contribute in defining measures to be taken and to analyze the effect of such measures. In this project basic modules of MARIS could be implemented after some modification.

An implementation of the ASAP system in every participating ROPME state is foreseen by ROPME and UNEP, while an adoption of the ASAP system as the backbone for storage, inventories and exchange of data and information for the Regional Seas program of the UNEP is under consideration of UNEP's managing board.

As a first follow-up Delft Hydraulics and MARIS were contracted by ROPME to ensure a transfer to ASAP of research data, that were collected during a recent NOAA cruise (Mt Mitchell) in the Arabian Gulf.

The ASAP system is PC-based and has a modular structure. It gives standard facilities for input and storage of marine data and information. Two levels have been incorporated: a reference level (MARIS) and a data level. The reference level is standard and equal for every type of data and information; the data level consists of various formats to handle all different types of environmental data. The system is supplied with various application software packages, such as a Spread Sheet, Statistical Software, a Geographic Information System, a package for importing Remote Sensing data, a package for spatially and grid-wise interpolating of data, and others. Users are free to implement their own application software, since various interfaces are supplied.

The benefits of the ASAP system are it's flexibility and transportability in combination with it's capability to handle all sorts of environmental data on both a referral and a data level.

## 4. EUROPEAN DIRECTORY OF MARINE ENVIRONMENTAL DATA - EDMED

The Commission of the European Communities assigned MARIS to carry out the EDMED (European Directory of Marine Environmental Data) inventory in the Netherlands. The EDMED inventory is a project within the MAST framework and aims to gain insight in the presence of large marine environmental data sets that are accessible to other users, at oceanographic research institutes, universities, governmental departments, offshore companies and geological organisations. For this purpose the British Oceanographic Data

Centre (BODC) developed the EDMED questionnaire which was used by MARIS to collect information about data sets and data holding organisations in the Netherlands.

MARIS completed its assignment in March 1992. At the same time the questionnaire was set out in all other European countries and it is the objective of CEC to compile and distribute an EDMED database on disk later this year.

Based on the results of the questionnaire in the Netherlands it can be concluded, that the EDMED form and chosen interview procedure together give an effective and fast method to identify environmental data sets, held by various organisations. The response and cooperation of data holding organisations was excellent, because of the high-level approach of the questionnaire. Particularly the disciplines Biology and Ecology give response results, which are not easily achieved by more detailed inventory methods. The EDMED inventory covers a broad spectrum and can fulfil the first need of potential users of environmental data.

## 5. NORTH SEA TASK FORCE - NORTH SEA RESEARCH PROJECTS DATABASE

In the framework of the North Sea Task Force MARIS is involved in the set-up and national collection of a North Sea Research Projects Database. The database is an initiative of the Department of Environment (UK) and all countries around the North Sea participate. At present the Database covers approximately 600 environmental research projects. It oversees a broad area of marine research and gives an effective entrance to research projects, knowledge, information and (indirectly) data in environmental disciplines, which are not easily covered with Databases, specifically aiming at datasets.

NATIONAL REPORT FOR THE PHILIPPINES

The Philippine Oceanographic Data Centre

## HISTORICAL BACKGROUND

After the Philippines became a member of the IOC, the National Committee on Marine Sciences (NCMS) was scientifically created on 18 June 1962 to serve as the focal point and coordinating body of the IOC on marine researches undertaken by various national agencies, institutions and laboratories of the government. In 1966, the NCMS designated the then Bureau of Coast and Geodetic Survey (now the CGSD of NAMRIA) to serve as the National Oceanographic Data Center (NODC). The Philippines became a participating member of the IODE system of the IOC in 1968 with the implementation of the project CSK.

## THE NODC AND THE OCEANOGRAPHIC INFORMATION SYSTEM IN THE PHILIPPINES

### Organization

The Philippine NODC (Figure 1), a unit within the Coast and Geodetic Survey Department (CGSD) of the National Mapping and Resource Information Authority (NAMRIA) was established to acquire, process, store, archive and disseminate oceanographic data.

It has six personnel (1 full-time and 5 part-time on an ad-hoc basis) all are permanent employees at the CGSD. Four have trained at the JODC in oceanographic data management, one of them have attended training at the Flinder University, Australia receiving instruction on a wide range of topics involved with the collection, processing and archiving of tidal and sea level data. One NODC employee is presently at the Flinders University undergoing training.

The NODC has a yearly budget of P 34,000 (US$ 1,360.00) the salary of its personnel not included.

### Information and Referral Services

Due to the NODC 's limited budget and personal the mandatory requirement of all government and private agencies, universities and institutions involved on marine science to submit oceanographic data was held in abeyance until such time that the NODG is capable of taking the full responsibility. For types of data and information not provided by NODC, NODC can provide service to users by referring them to other agencies and organizations. Request for marine information should identify completely specific data needed in the application submitted. The NODC products and services are provided for free (mutual exchange basis) or on a cost recovery basis in accordance with guidelines and policies established by the NAMRIA.

NCMS member agencies which hold/ observe marine information are as follows:

| Agency | Nature of data |
|---|---|
| 1. Philippine Council for Aquatic and marine Research and Development (PCAMRD) | Biology, Fisheries and Chemical Oceanography |
| 2. Bureau of Fisheries and Aquatic Resources (BFAR) | Biology, Fisheries and Chemical Oceanography |
| 3. Mines and Geo-Sciences (MGB) | Marine Geology and Geophysics |

| | |
|---|---|
| 4. Marine Science Institute (MSI) University of the Philippines | Biology, Fisheries Chemical and physical Oceanography |
| 5. National Mapping and Resource Information Authority (NAMRIA) | Physical Oceanography, Geology, Geophysics and Meteorology |
| 6. Philippine Coast Guard (PCG) | Contamination/ Pollution |
| 7. Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) | Meteorology, Geology, Geophysics and Physical Oceanography |
| 8. Institute of Marine Fisheries and Oceanography, College of Fisheries (UPV-CF), University of the Philippines in the Visayas. | Chemical Oceanography, Biology and Fisheries |
| 9. Tawi-Tawi College of Technology and Oceanography (TCTO) Mindanao State University | Chemical Oceanography, Biology and Fisheries |
| 10. National Museum (NM) | Marine Archaeological Properties/ Resources |

NODC Oceanographic Data Holdings

The following are the sets of data holdings in the NODC :

1. Oceanographic data actually observed by Filipino scientists as a result of observations from cooperative projects.

2. Data acquired through direct bilateral exchange with other countries and through the IODE system.

3. Data observed by NAMRIA in the performance of its function as a hydrographic and oceanographic office of the government.

NODC data holding include (Table 1) : measurements of water temperature, salinity, water analysis ocean meteorology, bathymetry, tides, tidal and ocean currents, BT data, etc.

Data are available in forms, reports, publications, and/ or floppy disks.

Data Processing and Management

Two (2) short term experts dispatched by the JODC in 1988 and 1989 have assisted in the development of the NODC by providing computer equipment and developing softwares on oceanographic data processing and management. Other softwares and equipment were also provided by the ASEAN-Australia Cooperative Programme on Marine Science Projects Tides and Tidal Phenomena (TTP) and Regional Ocean Dynamics (ROD). Further development of softwares are being undertaken by the NODC personnel.

Figure 2 shows the data/ information flow of the Philippine Oceanographic Data Center.

International Cooperation and Exchange

Aside from being a participating member of the IODE system since its establishment, the NODC have been involved on the following ocean research programs :

1. Cooperative Study of the Kuroshio Current and Adjacent Regions 1968 Summer and 1969 Winter Cruises (CSK)

2. ASEAN-Australia Cooperative Programme on Marine Sciences

    2.1 Tides and tidal Phenomena (TTP) Project

    2.2 Regional Ocean Dynamics (ROD) Project
    Current Metering Experiment

3. Global Sea Level Observing System (GLOSS)/ PSMSL

4. Integrated Global Ocean Services System (IGOSS)/ IGOSS Sea Level Project in the Pacific (ISLPP)

5. Tropical Ocean and Global Atmosphere (TOGA)

6. World Ocean Circulation Experiment (WOCE)

7. Pacific Tsunami Warning System (PTWS)

Table 1 : NODC DATA HOLDINGS

| Data Item | Data Attribute |
|---|---|
| 1. Tidal Current | Latitude, Longitude, direction at rising tide and direction at falling tide |
| 2. Tide | Latitude, Longitude, Tide station name, datum below BM, zero of tide staff,number of tidal components, amplitudeand delay angle of each tidal component |
| 3. Ocean Meteorology | Latitude, Longitude, data observed, wind direction, wind force, atmospheric pressure atmospheric temperature, visually observed wind direction, and wave height |
| 4. Water Temperature | Latitude, Longitude, depth, date observed, number of layers observed, depth and temperature of each layer |
| 5. Surface Water Temperature | Latitude, Longitude, date observed, water temperature |
| 6. Ocean Current | Latitude, Longitude, date observed, observation instruments, current direction, current velocity, northward and eastward components of current velocity |

| | |
|---|---|
| 7. Salinity | Latitude, Longitude, depth, date observed, number of layers observed, number of standard layers, depth and salinity of each layer |
| 8. Water Analysis | Latitude, Longitude, depth, date observed, number of layers observed, depth, DO, PO4,total P, NO2, NO3, N, Si, and pH of the layer observed, depth, DO, T, thermostateric anomaly, specific volume anomaly, dynamic depth anomaly, and speed of sound of the standard layer |

Figure 1 : Oceanographic Division
Coast and Geodetic Survey Department
NATIONAL MAPPING AND RESOURCE INFORMATION AUTHORITY

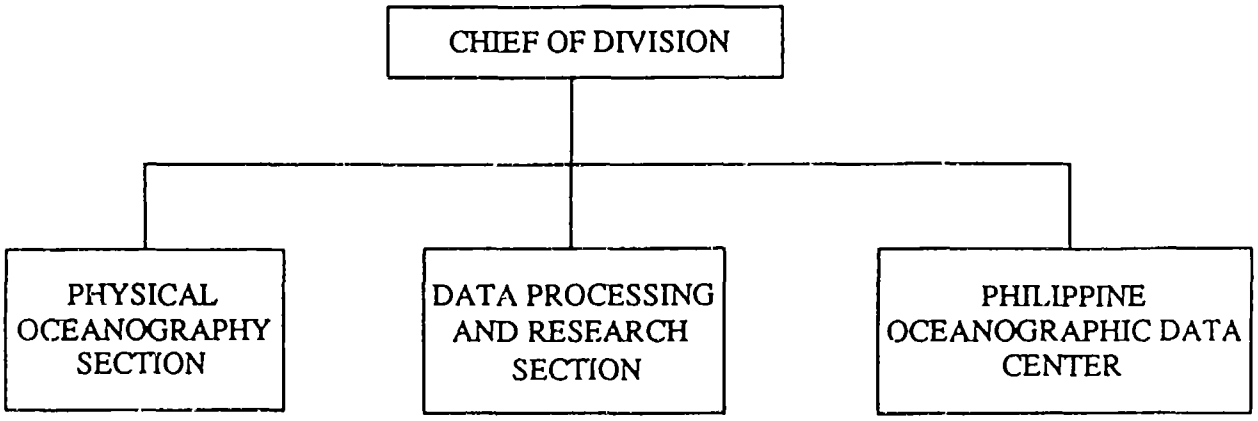
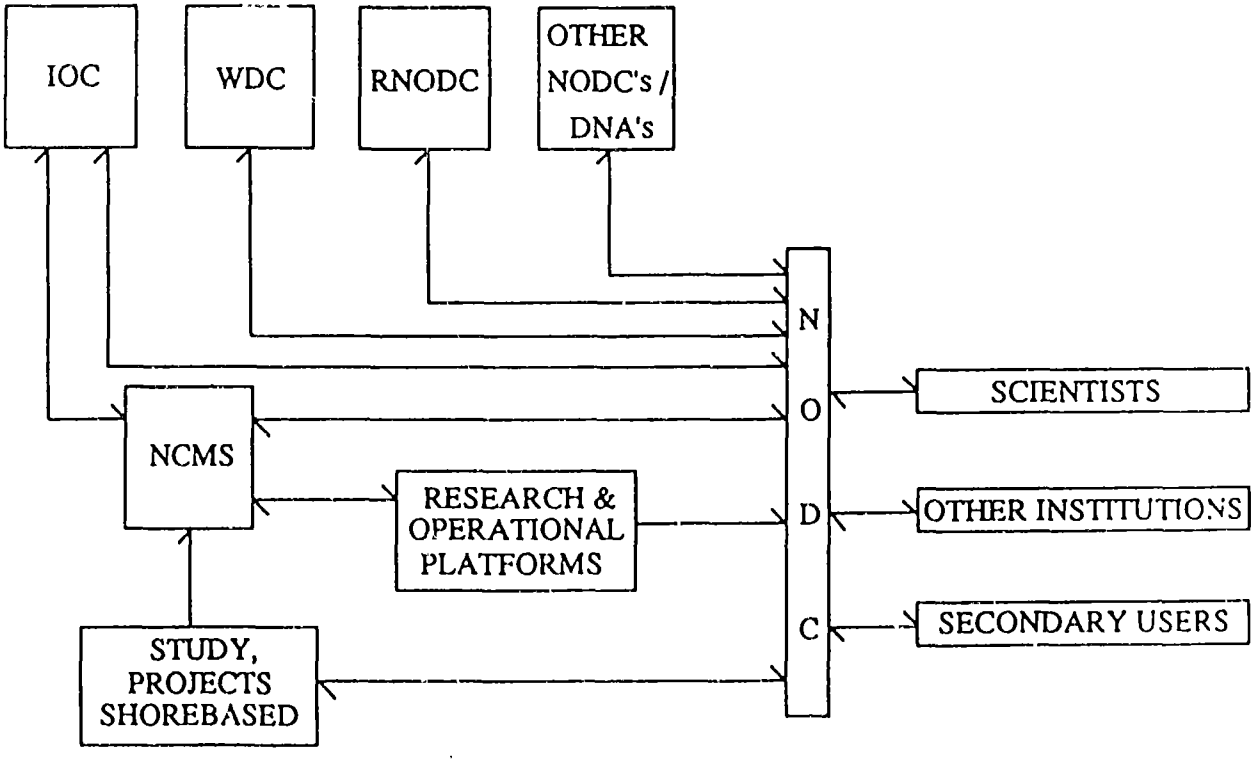



Figure 2 : NODC Data / Information Flow



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| 3. | Mines and Geo-Sciences Bureau (MGB) | Geology and Geophysics |
| 4. | Marine Science Institute (MSI) University of the Philippines | Biology, Fisheries, Chemical and Physical Oceanography |
| 5. | National Mapping and Resource Information Authority (NAMRIA) | Physical Oceanography, Geology, Geophysics and Meteorology, Satellite Information |
| 6. | Philippine Coast Guard (PCG) | Contamination/Pollution |
| 7. | Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) | Meteorology, Geology, Geophysics and Physical Oceanography |
| 8. | Institute of Marine Fisheries and Oceanography, College of Fisheries (UPV-CF), University of the Philippines in the Visayas | Chemical Oceanography, Biology and Fisheries |
| 9. | Tawi-Tawi College of Technology and Oceanography (TCTO) Mindanao State University | Chemical Oceanography, Biology and Fisheries |
| 10. | National Museum (NM) | Marine Archaeological Properties/Resources |

## NATIONAL REPORT OF THE RUSSIAN FEDERATION

### Oceanographic Data & Information Management Activity

During the intersessional period NODC of Russia has performed its activity in the following directions:

- acquisition and accumulation of oceanographic data, obtained by marine agencies of the former USSR;
- creation of multilevel data set with deep-water observations for the World Ocean;
- development of systems of quality control data, using PC computers;
- providing the users with information products and services.

Within the framework of the national project of supporting the system of oceanographic information acquisition and distribution (SCSOI)* NODC undertakes some efforts on maintaining the former system of acquisition and distribution of oceanographic information on the national level. In particular, NODC started to carry out some actions on retrieval and resque of oceanographic observation data in Russia.

NODC also actively participates in realizing the project IODE/IGOSS GTSPP, particularly in subprojects the Historical Aspects of the GTSPP and Time Series project.

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* State Computerilized System of Oceanographic Information

### Marine Information Management

Arctic and Antarctic Research Institute of Roscomgidromet jointly with A.Vegener Instutute of Polar and Marine Research, Germany, has prepared and is publishing Oceanographic Atlas for the Southern Ocean (to the south of 30 deg.South), incorporating practically all historical data. This Atlas will be presented both

in printed form and on computer-compatible media. Besides, also jointly with A.Vegener Institute the preliminary project of Oceanographic Atlas for the Greenland convective gyre has been prepared within the framework of the Greenland Sea Project. The observation data base of the Atlas incluudes information for 1982-90.

All-Russian Research Institute of Hydrometeorological Information-WDC (RIHMI-WDC) actively develops further the international book exchange in the field of hydrometeorology and natural environment monitoring. We keep in contact with 300 organizations from 80 states. For the period 1990-91 650 publicationnnnns have been recieved and 680 have been sent abroad.

The development of computerized system of scientific and technical information in marine sciences has been further improved, being a part of the national STI system, which provides the users with information available in RIHMI-WDC (Obninsk) via telecommunication channnels.

## The developmentof techniques for acquisition and processing of marine information

NODC of Russia has received from the Germany -as a gift- a powerful computer "Cyber 180-840", which is currently being adjusted.

A number of Russian reseach agencies performs joint development of the national computerized system of oceanographic information aimed at promoting the new efficient techniques of data acquisition, processing, storage and distribution.

## IODE activities in Russia for 1990-92

GF-3 Training Courses were conducted in RIHMI-WDC (Obninsk) in May 1990 for the specialists from developing countries. The Second meeting of the Working Group on GTSPP Project also took place in Obninsk in July 1991. In August 1992 the Meeting on problems related to oceanographic data bases and data banks was held, pioneered by the IOC and ICSU. At the Meeting, run by the IOC

representative, Yu. Oliouninne, some recommendations have been worked out to avoid difficulties appeared in the IODE system within the area of the former USSR due to the changes in economic and political situation.

The agreements have been reached on scientific and technical cooperation which provide for bilateral oceanographic data exchange with USA, China, DPRK, Germany.

In 1991-92 the meetings of WDC-D and WDC-A Directors took place in Russia, where the issues of interactions between the centers were discussed.

The activity of WDC-B has been further developed in the field of oceanography and marine geology and geophysics, RNODC IGOSS and RNODC MEDALPEX.

**Acquisition & Accumulation of Oceanographic Data**

Creation of multilevel deep-water
observation data set for the World Ocean.

Russian NODC has worked out a concept and started to perform the formation of oceanographic observations base as multilevel data base , which is a hierarchy of sets.
0 - level represents an information base on data and metadata, functioning in computerized information - reference system
1 - level represents a base-line set of oceanographic observations

Sets of higher levels : second-set on standard levels ; third estimations of regime statistics in one-degree square; fourth - estimates of monthly means and variance in points of one-degree square. Sets of 1-4 levels are stored in national formats , developed using the code BUFR.

The project has been realized since 1989. Work on preparation of the first level set is practically finalized by the present. The set contains over 1500 oceanographic, bathythermograph and CTD/STD stations. On preparing the set historical , delayed and operational (BATHY/TESAC) data available for NODC ,are assimilated. The tasks of formation of II-IV levels sets have been realized as applied to the region of the North-European basin of the Atlantic Ocean (Barents Sea, Norwegian Sea and Greenland Sea). Bases of data on hydrophysical and meteorological parameters are accessible in the form of electronic atlas via PC, which allows to perform data visualization, retreival and sampling. The creation of the set for the World Ocean is planned to finalize the computer system Cyber 180-840 made available to NODC as a gift via IOC.

Data QC

One of Russian NODC major tasks is creation of "climatic" data sets of high quality which are needed for solving the problem of the climatic studies. By this is meant the creation of the global merged data set which was subject to multilevel QC. Within the framework of this efforts the Manual of IODE QC has been created in NODC. NODC actively participated in development of GTSPP QC Manual preparation, put into practice the technique of QC GTSPP as the program complex and utilized it, making research in the field of development of QC procedures for hydrochemical parameters and currents. When doing this Russian NODC closely interacts with US NODC.

Creation of data processing using PCs.

Since 1991 NODC has been undertaking active actions on creation of system of oceanographic data processing via PC with a view to unifying the techniques of data acquisition and preprocessing in the network agencies of Russian Committee for hydrometeorology and other organizations making oceanographic observations. In this sense the idea of creating the system is close to the tasks set by IOC/IODE project "OCEAN-PC". By the present the subsystems of

data preprocessing is realized, incorporating data input, data control , sampling and statistical analysis of observation data in interactive mode with PC usage.

## Data archaeology

Russian NODC started to perform active work on retrieval and rescue (archaelogy) of oceanographic observation-data. About 3500 foreign cruises, stored in WDC-B, are catalogued as well as about 1000 cruises, received by Russian NODC from different scientific-research marine agencies, whose data are not entered on computer-compatible media. It is possible to assess the accessioning to Russian NODC of materials for about 800-1000 cruises , not entered on computer-compatible media, in 1992-93. The activities on retrieval and rescue of data on the national level are performed within the framework of the national project on development of acquisition system of oceanographic data.

In 1992 NODC of Russia started practical work on entering the national data. With this in view some special procedures of entering the data on computer-compatible media have been developed , which in particular provide for double input, as well as GTSPP data quality control. Before the end of 1992 Russian NODC is planning to enter about 45-50 thousand of deep-water observations. Within the framework of NODC coordination activity the data are also entered on computer- compatible media in other marine agencies of Russia. In 1992, in particular,about 50-70 thousand of BT profiles will be entered on computer-compatible media. The substantial part of these data is planned to be transmitted to IODE system.

## Information products and services provided by Russian NODC.

NODC provides the services and makes information products available in the course of realization of tasks on informational servicing the scientific research programmes of the study of the World Ocean , and also meeting one-time request of marine agencies of the country.

NODC of Russia has started to create and dissipate the following products: climate-related data sets of high quality on standard depth , sets of climatic parameters of main geophysical characteristics (climatic normals, root-mean squares, some additional statistics ) in points of 1*1 grid trapezium and in points of one degree regular grid , the results of monthly and seasonal analysis of the state of temperature and salinity fields for upper 500m layer for the Northern Atlantic and Pacific Ocean basing on IGOSS data.

IGOSS/IODE project for GTSPP.

Russian NODC acts as representative of Russia in GTSPP and actively participates in realization of such projects as: the Historical Aspects of the GTSPP and Time Series Project. It should be noted that the activity undertaken on data retrieval and rescue has been performed up to present within the framework of this project. Some preliminary efforts have been also made by NODC for the purpose to generate GTSPP unified catalogue of historical data and time series inventory.

The national project of support of acquisition and processing systems of oceanographic information.

The national project of support of the State Computerised System of Oceanographic Information (SCCOI) was established to support and perfect the system of oceanographic information acquisition, unifying and updating the procedures of data acquisition, exchange formats, ways of data transmission for the purpose of preparing the state holding of data and the effective servicing the final users with data and information products. On national level the program of data retrieval and rescue is being realized within this project framework. In fact this project is currently the only state programme, coordinating actions of ship-owners from different agencies and maintaining the system of oceanographic data acquisition exchange over the area of Russia and within the CIS territory.

## NATIONAL REPORT ON INTERSESSIONAL ACTIVITIES IN SWEDEN

The Oceanographic laboratory of Swedish Meteorological and Hydrological Institute (SMHI) acts as a DNA within the IODE system.

During the intersessional period 1990-1992 the main activities at the DNA were:

- Change of computersystem from Norsk Data to VAX (incl. PC's and Macintosh). The DNA-computer is connected through DECNET to the VAX-system at the head office in Norrköping.
- The oceanographic databanks have been converted from random access-files to a relational database (MIMER).
- Historical data from Swedish lightships (about 100.000 series) are now being incorporated into the relational database.
- Much effort has been devoted to the ICES coordinated project SKAGEX and the Swedish-Finnish project GULF OF BOTHNIA YEAR.
- Wave-, sealevel-, temperature-, salinity- and current-data are now available in real-time from a number of Swedish light-caissons.
- Waterbottle data, compressed CTD-data and biological data have been submitted to ICES, Helsinki Commission and OSPARCOM.
- Sweden's participation in TESAC has been patchy due to continuous problems with the CTD's.
- A thermosalinograph has recently been installed on the R/V Argos and TRACKOB-messages will be submitted through GTS.
- NOP's are submitted regularly to IOC.
- CSR's are produced using the ICES developed software (included in the OCEAN-PC) and submitted to ICES.
- Swedish Cruise Reports are now computerized and stored in the VAX-computer.
- In 1993 the laboratory will be accessible through OMNET.
- In December 1990 the Swedish National Co-ordinator represented IOC/IODE at an "Informal Data Expert Meeting on Helsinki Commission Data Banking", Helsinki.
- In October 1992 the Co-ordinator was engaged by IOC as a course lecturer at the IOC/ROPME "Regional Training Course on Marine Data and Information Management on Microcomputers", Kuwait.

# NATIONAL REPORT OF THAILAND

## Status of Oceanographic Data Management in Thailand

### INTRODUCTION

Oceanographic data is considered a public asset and a national resource that can be used for the benefit of the whole country. Ideally, there should be a National Data Center located in each country to accumulate data that is not easily available and to develop a central archive of usable, quality controlled data as well as to develop a data management system to safeguard the data for future use. However, such National Oceanographic Data Center has not yet been established in Thailand. This paper describes briefly the current status of information on available oceanographic data and information regarding the oceanographic data management in Thailand.

### RESEARCH ACTIVITIES

There have been a variety of studies conducted regarding marine research activities in Thailand. Much of the studies are undertaken by various groups from the local universities and government agencies, such as follows:

- Department of Marine Science, Chulalongkorn University
- Faculty of Fisheries, Kasetsart University
- Faculty of Aquatic Science, Prince of Songkhla University
- Faculty of Aquatic Science, Burapha University
- Asian Institute of Technology
- Hydrographic Department, Royal Thai Navy
- Thailand Remote Sensing Center, National Research Council
- Office of the National Environment Board
- Department of Fisheries
- Harbor Department
- Meteorological Department

The collection of oceanographic data is difficult and expensive, and usually requires proper research vessels and appropriate equipment. Therefore, oceanographic studies in offshore areas are mostly carried out by the Hydrographic Department of the Royal Thai Navy and the Department of Fisheries since they own several proper-size research vessels with satisfactory position-fixing system and laboratory facilities on board. Otherwise, most of the works being carried out by other institutions are mainly confined in the estuarine and coastal areas.

Recently, under the ASEAN-Australia Cooperative Programme on Marine Sciences, the Regional Ocean Dynamics Project has been developed for ASEAN. This 5 years project, (1989-1994), is being implemented in Thailand under close co-operation between the National Environment Board (NEB), the Hydrographic Department and the National Tidal Facility (NTF) of Australia. The aim of this programme is to carry out a comprehensive study of tidal phenomena in the ASEAN region.

The Regional Ocean Dynamics Project has over many years, developed a comprehensive network of tide gauges systematically gathering sea level data over the length and breath of ASEAN. Data collected from all 58 tidal stations in the Region have been sent to the ASEAN data bank, situated at the Tidal Laboratory, Flinders Institute for Atmospheric and Marine Sciences, Flinders University of South Australia, for processing on an IBM compatible PC. Activities in data processing included reading from cartridges and cassettes, digitization of graphic data and preparation of card images have been carried out regularly. Raw data are harmonically analyzed in order to obtain the harmonic constants and the residual series of the corresponding period.

The second oceanographic study that has recently been developed is the SEAWATCH THAILAND Project. SEAWATCH is a complete marine environmental monitoring and forecasting system which integrates data collection, data analysis, environmental modeling and forecasting with an advanced computerized system for distribution of marine information and forecasts to interested operators and/or authorities. This 3 years project, (1991-1994), is being implemented under close co-operation between the National Research Council of Thailand (NRCT), OCEANOR, the oceanographic company of Norway, and other involving parties, such as the Harbor Department, the Meteorological Department, Port Authority of Thailand, Naval Hydrographic Department, Department of Fisheries, the Petroleum Authority of Thailand, Marine Police Division and universities.

A near real time data covering is provided by a network of moored data collection buoys (called TOBIS buoys), which includes measurements of meteorological parameters (wind speed & direction, air temperature & pressure) and oceanographical parameters (oxygen/algae/nutrient contents, waves, currents, salinity/temperature profile and radioactivity). NRCT has successfully deployed four TOBIS buoys at Sichang Island, Rayong Bay, Chang Island, and Plathong oil platform. The other three buoys will be in place within the next six months.The buoy-transmitted data is transferred from ARGOS office in France to NRCT on a daily basis. The data is then processed and stored in the ORKAN database.

## DATA MANAGEMENT

To date, observational as well as processed data related to marine research, environmental studies, fisheries and pollution monitoring, are normally stored either in hard copies, as Annual Reports, or on diskettes in database format set-up by each indi-

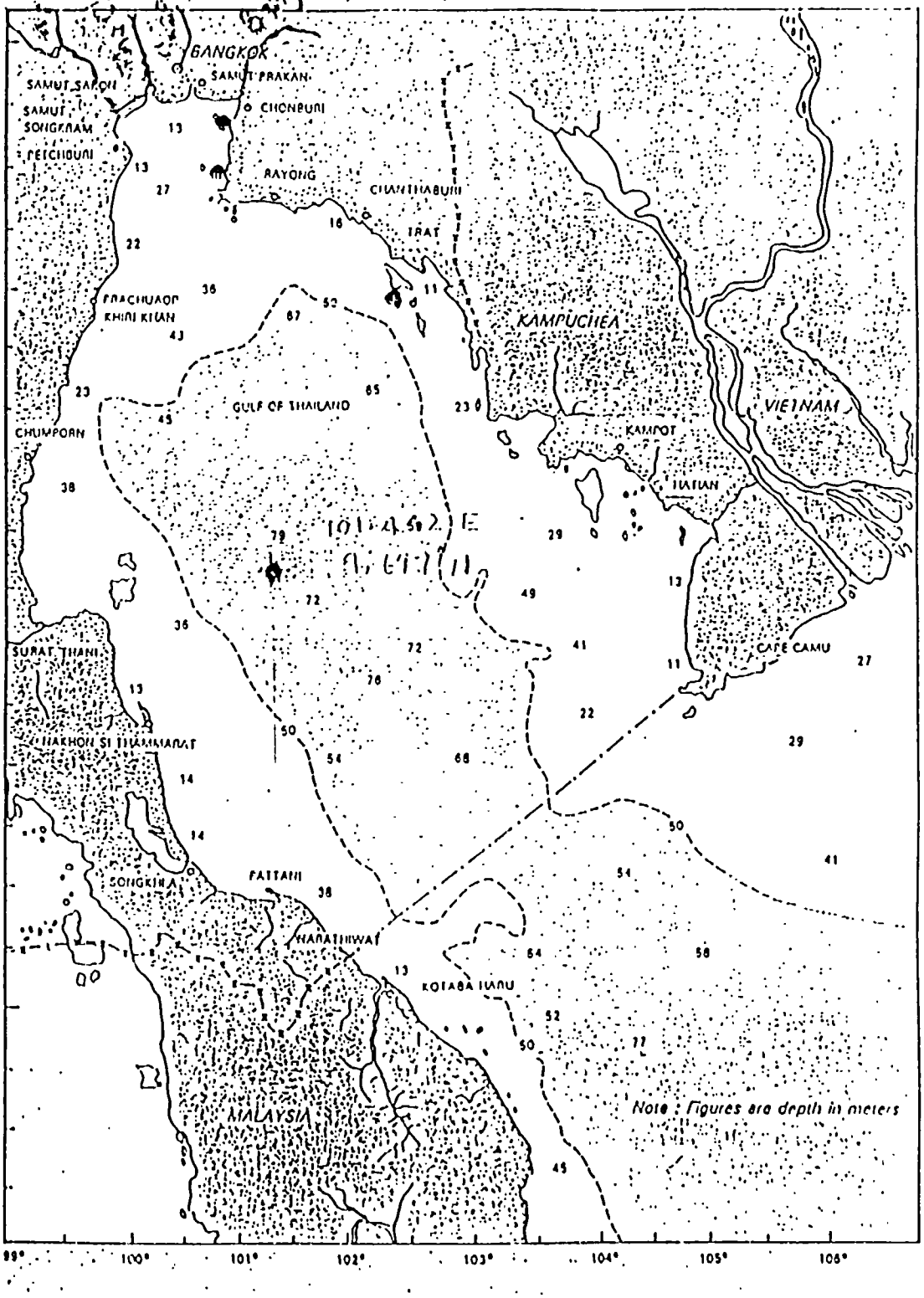
monitoring, are normally stored either in hard copies, as Annual Reports, or on diskettes in database format set-up by each individual institutions involved in the research projects. Hence, a number of organizations in Thailand hold quantities of oceanographic data and manage them to serve their own purposes. Often, these organizations have difficulty with some research projects due to lack of data since access to the data collections of each agency is not always freely available to the public.

In the near future, the National Oceanographic Institute of Thailand (NOI) is going to be established under the Ministry of Science, Technology and Environment. The National Oceanographic Data and Information Center will then be established under NOI with the following objectives:

1. Protect and safeguard valuable scientific data.
2. Develop a large archive of all available data for Thailand's area of marine interest.
3. Improve cooperation with the exchange of data between Thai marine science organizations and international agencies.
4. Effectively utilize the limited resources available in Thailand for oceanographic data management.

A systematic approach needs to be developed for the task of acquiring the data from organizations within Thailand and overseas such as the data centers in the USA, Japan and Australia. Improving cooperation by the free exchange of data and the development of a single, high quality data set would overcome some of the existing data related problems we are facing now in Thailand.

Figure 8.1 The Gulf of Thailand Showing 50 Meter Depth Contour



# NATIONAL REPORT OF TURKEY

## NATIONAL MARINE INFORMATION AND OCEANOGRAPHIC DATA MANAGEMENT REPORT OF TURKEY

The Department of Navigation Hydrography of Turkey is the responsible organization for archiving oceanographic data. The necessary infrastructure has been acquired and automatic data handling capacity achieved. For the time being training in oceanographic data management, quality control, service and product development are needed. Assistance and cooperation in these fields will be appreciated. Concerning oceanographic data exchange, after establishment and employing qualified personnel, oceanographic data exchange at national and international level will be encouraged. Necessary actions will be taken in order to promote oceanographic data exchange in order for a better utilisation of oceanographic data collected from cruises conducted by Turkish research vessels in the Turkish area of interest - mainly the Levantine Sea, the Aegean Sea and the Black Sea. For the time being data exchange policy and monitoring are matters of discussion. Afterwards exchange and monitoring will be upgraded.

NATIONAL REPORT OF THE UNITED KINGDOM

# BODC British Oceanographic Data Centre

## ANNUAL REPORT 1991-92

### 1991-92 Highlights

- the release of the first global set of digital bathymetric contours for the world's oceans
- the assembly of more than 95% of the data collected during the North Sea Project
- the successful operation of on-line databases for the BOFS and North Sea Projects with over 1000 remote user sessions logged
- the first year of operation of the WOCE Data Assembly Centre for sea level data
- the completion of the EDMED pilot project
- the addition of 350 new charts to the UK Digital Marine Atlas
- the servicing of 463 ad-hoc customer requests

### ummary

ne year under review represents ODC's third year of operation since eing set up by the Marine and tmospheric Sciences Directorate tASD) of NERC in April 1989. Good rogress has been maintained across a road spectrum of activities ranging from :e working up of large volumes of field ata through to the development and elease of high quality digital data roducts. The data centre continued to njoy a close working relationship with a nde community of marine scientists and ata managers both at home and abroad.

ODC's work is organised on a project asis with each project having well efined goals and a clearly identified stomer. The projects fall naturally into ree categories:

) data management support for MASD's Community Research Projects. At present this involves the North Sea, BOFS and WOCE Projects but plans are also being laid for supporting the forthcoming LOIS, VIVALDI and PRIME Projects.

) development of data products including the UK Digital Marine Atlas Project (UKDMAP), the General Bathymetric Chart of the Oceans (GEBCO) and the European Directory of Marine Environmental Data (EDMED)

c) well-found data centre activities covering the maintenance and development of the national oceanographic database, the servicing of ad-hoc customer requests, maintaining data inventories, and participating on behalf of the UK in the international management and exchange of oceanographic data

*The distribution of BODC staff effort during 1991-92 weighted according to staff grades.*

A particularly satisfying feature of the year's work was the release of major products from the UKDMAP, GEBCO and EDMED projects - all three products were masterminded by BODC from initial proof of concept through systems design and implementation, to product development and release. They also involved BODC in coordinating the assembly of data and information from many sources both in the UK and abroad. Other products included the Station Handbook for IOC's Global Sea Level Observing System (GLOSS) and the Second Edition of the International Current Meter Inventory - both of which were developed by BODC as PC-based systems and released in early 1991. Such products have been made possible by the revolution in computing technology which BODC is keen to exploit. For its next range of 'electronic publications' BODC will be making use of optical disk technology with the release of a CD-ROM for the North Sea Project data set. Plans are also in place for producing CD-ROMs for GEBCO and for the BOFS North Atlantic data set.

Over the past three years BODC has found the challenge of providing data management support to the North Sea and BOFS Projects to be both demanding and rewarding. New techniques and procedures have had to be pioneered to ensure an orderly and timely flow of high quality data onto the projects' databases and to the participating scientists. BODC's role has been to work up the data from the ship's sensors and to combine these with measurements from bottle samples, net hauls, cores and moorings worked up by scientists spread over four NERC laboratories and eight University departments. A unique partnership has been developed between data centre staff and project scientists. The data management, processing and programming skills at BODC have been combined with the oceanographic experience of the project communities to develop a system which has produced quality controlled, calibrated data sets from 49 research cruises in just over three years. In this period BODC has processed 115 000 nautical miles of underway data and 4300 CTD casts and has assembled data from over 15 000 water bottle samples and 300 cores. The data centre resources used to achieve this were relatively modest and far outweighed by the time liberated in the scientific community by the removal of the data management burden.

*On the BOFS and North Sea ... BODC has amassed data from ... samples*

## North Sea Project

BODC's role in managing data for the North Sea Project is now reaching its final stages. Having been heavily involved in processing the data from the 30 cruises of the main field programme in 1988/89 and the 3 follow-up cruises in 1990, work over the past year has concentrated on assembling final versions of all good quality data collected during the Project and on preparing appropriate documentation to accompany these data. This material will form the basis for an electronic publication of a definitive data set for the Project which will be released on CD-ROM in late 1992.

An extensive inventory of the Project's data was compiled and published, and was used as the basis of a data tracking system for searching out outstanding data. Major acquisitions during the year included data on trace metals, inorganic and organic atmospheric chemistry, primary production, and phytoplankton species distributions. After checking, these data were loaded onto the Project's on-line database. Some 20 cruises of shipboard ADCP data were also received together with the current meter and ADCP data from the moored instruments deployed during the Project. By April 1992 it was estimated that BODC had assembled more than 95% of the Project's data.

Considerable effort was devoted to screening all the diverse data received and to ensuring that when plotted out they appeared internally consistent with no obvious errors. Where possible, data were cross-checked for consistency with other concurrent measurements. In particular, some 70 000 nautical miles of underway thermosalinograph, fluorimeter and transmissometer data (comprising 1.4 million data records) were visually checked using a graphics workstation. At year end the Project database contained data from over 10 000 water samples, with nutrient determinations on over 6000, extracted chlorophylls and suspended matter on nearly 5000, trace metals on 1700 and sulphur compounds and halocarbons on nearly 800.

The Project's on-line database continued to be accessible over the JANET network and over 750 remote sessions were logged against it by scientists at eight NERC laboratories and university departments. Development of the PC-based user interface to accompany the CD-ROM continued. An additional 8000 lines of Turbo-Pascal code were written incorporating feature extensions to display the water bottle data, underway data and satellite image data and to enable user access to the underlying data.

## Biogeochemical Ocean Flux Study (BOFS)

Close collaboration was maintained with the BOFS community in working up and assembling the data from the BOFS field programme centred on the 20° W meridian in the North Atlantic. This included the 1989 Spring Bloom Experiment (three cruises of RRS *Discovery*), the 1990 Lagrangian Experiment (three cruises of RRS *Discovery* and two of RRS *Charles Darwin*), the 1990 benthic cruise, and the 1991 Coccolithophore Bloom Experiment (two cruises of RRS *Charles Darwin*).

BODC continued to calibrate, quality control and process the underway measurements from the pumped water supply and the CTD casts. Over 100 CTD casts were worked up from the 1991 cruises and the underway data were worked up for five of the 1990 and 1991 cruises. The latter comprised over 400 000 data records, with from 23 to 42 data channels per record, and the resultant data were graphically presented in data reports for use by BOFS scientists. Relational techniques were developed for handling the 1990 SeaSoar data, breaking it down into discrete vertical profiles at 4 km intervals. Some 1089 such profiles on nine transects were worked up and visually screened on a point by point basis.

In addition to its data processing support to BOFS, BODC has been actively chasing up all the data worked up by the BOFS scientists for assimilation into the Project's on-line database. Virtually all of the 1989 data has been now been lodged at BODC with the submission of the outstanding data on phycoerythrin; phytoplankton and bacterial counts; microzooplankton biomass, bacterial productivity and radionuclides. Good progress has also been made in acquiring the 1990 data and a significant start has been made with the 1991 data. During the year 300 sessions were logged against the Project's database by BOFS scientists extracting out data for their research.

By the end of the year the database contained data from over 5000 water bottle samples (primarily measurements of nutrients, chlorophyll, organic carbon and nitrogen and carbon dioxide); almost 1300 productivity measurements; chemical, sedimentological and bioturbation data from 259 cores; phytoplankton species distributions from 105 samples; 16 zooplankton grazing experiments, 39 zooplankton biomass stations and 43 mesozooplankton gut content determinations, 535 CTD casts, 93 XBT profiles and over 45 000 nautical miles of underway data.

Good progress was made in compiling the documentation to accompany the assembled data - an essential precursor to the electronic publication of the final version of the BOFS North Atlantic data set which is scheduled for release at the end of 1993.

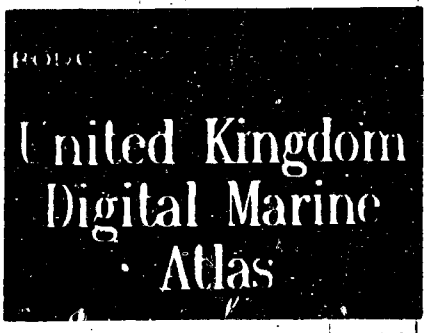
## World Ocean Circulation Experiment (WOCE)

In early 1991 BODC began operating as the International WOCE Data Assembly Centre for hourly sea level data monitored on a global network of 110 tide gauge sites. Communication has been established with most of the authorities responsible for the individual gauges and systems have been set in place at BODC to subject the incoming data to a detailed set of quality control checks. Once data flows routinely it is anticipated that the global data set will be available for distribution on an annual basis within 18 to 24 months of data collection.

A total of 286 site years of sea level data have been supplied to BODC from Argentina, Bahamas, Chile, Cuba, Denmark, Ecuador, Iceland, Japan, New Zealand, Portugal, Philippines, Russia, UK and the USA, with a further 450 site years of data from the TOGA Sea Level Center in Hawaii. So far most of the data are historical (pre-1990) and steps are being taken to encourage authorities to submit data on a more routine basis with reduced delay. By year end some 635 site years of data had been reformatted and passed through BODC's quality control checks.

Considerable progress was made in sorting through some 300 magnetic tapes from the Institut für Meereskunde, Kiel containing Sea Rover data collected on cruises in the North Atlantic between 1981 and 1987. The data have been condensed down to six magnetic tapes (one per cruise) and data from two cruises have been converted into BODC's standard internal format in preparation for screening on a graphics workstation. It is hoped that the full data set will be available for release in early 1993. Further work was initiated to recover the CTD data from the Rockall Trough Shelf sections routinely collected by the Dunstaffnage Marine Laboratory since the mid 1970s.

Discussions continued with scientists at the James Rennell Centre and Liverpool University to develop a data management plan for the proposed ATLANTIC Project and BODC participated in the ALVALDI pilot cruise to study the problem at first hand.





*Title screens of BODC's electronic publications*

## European Directory of Marine Environmental Data (EDMED)

The aim of EDMED is to provide a comprehensive and regularly updated referral system to the marine environmental data sets held in the member countries of the European Community. It will be available as a PC-based directory and will contain descriptions of data sets dispersed across hundreds of different laboratories, universities, government departments and commercial companies.

BODC has been working under contract with the Marine Science and Technology (MAST) Programme of the CEC to design and develop the EDMED system. Simple, free-text input forms have been designed for the data holding centres to describe their data sets. Work has also been completed on the development of an extensive PC-based software package to support the input and output of information to and from the directory, and to maintain the directory and its search tables. The package, written in Turbo-Pascal, contains over 30 000 lines of code.

A user-friendly interface enables the contents of the directory to be searched and browsed interactively, and for information to be extracted out on a selective basis for the production of high quality reports. Search tables enable data set descriptions to be selected by country, institution, geographic area, coastal zone, time period and data type.

The EDMED forms have been extensively tested out in Ireland where, in collaboration with the Department of the Marine, Dublin and the Irish Science and Technology Agency EOLAS, BODC has compiled information on 116 marine data sets held by 56 different groups. This work was undertaken as a pilot project to test the viability of the EDMED system and to provide a base of information against which to test and debug the supporting software. Those who contributed data descriptions have expressed enthusiasm for the resultant product, which in the first instance was issued as a hard copy directory.

Following the success of this pilot scheme the CEC has commissioned BODC to extend EDMED to all other member countries and a network of national focal points has been established by BODC to compile data set descriptions for Belgium, Denmark, France, Germany, Greece, Italy, Portugal, Spain and the UK. Information for the Netherlands has already been submitted to BODC.

## General Bathymetric Chart of the Oceans (GEBCO)

BODC has an international responsibility for creating and developing the GEBCO Digital Atlas. With funding provided through MAST, this work is carried out under the joint auspices of the Intergovernmental Oceanographic Commission (IOC) and the International Hydrographic Organisation (IHO).

In the early 1980s a Fifth Edition of GEBCO was published by IOC/IHO as a set of 18 printed charts of contoured bathymetry covering the globe at a scale of 1 to 10 million. Over the past few years BODC has been coordinating the digitisation of these charts at centres in France, Russia, Japan and the UK. Laser scanning techniques have been used to digitise the depth contours and the coastlines from stable base transparencies of the published charts. As each chart has been digitised it has been submitted to BODC for quality checking and editing, and for reformatting in a form suitable for distribution to users.

A major milestone was reached in May 1992 with the completion of the digitisation programme and the release of the first digital data set covering the bathymetric contours of the world's oceans. During the year the two remaining sheets in the equatorial western Pacific were completed using digital data provided by the Japanese Oceanographic Data Center and NERC's Unit for Thematic Information Systems. In order to produce a seamless global bathymetry, an edgematch between the digital data for adjacent GEBCO charts was carried out, paying close attention to the trackline control on the original printed sheets when adjusting contours.

The bathymetry of the final sheet in the series, covering the northern part of the South Atlantic, has recently been revised by the GEBCO Guiding Committee and will be republished by the Canadian Hydrographic Service in 1993. The revised bathymetry was prepared by experts in the USA, Russia, New Zealand and the UK and submitted in hard copy form to BODC. The various sections of the chart have been digitised and edgematched at BODC and the resultant digital data set will be used as the basis for publishing the revised chart.

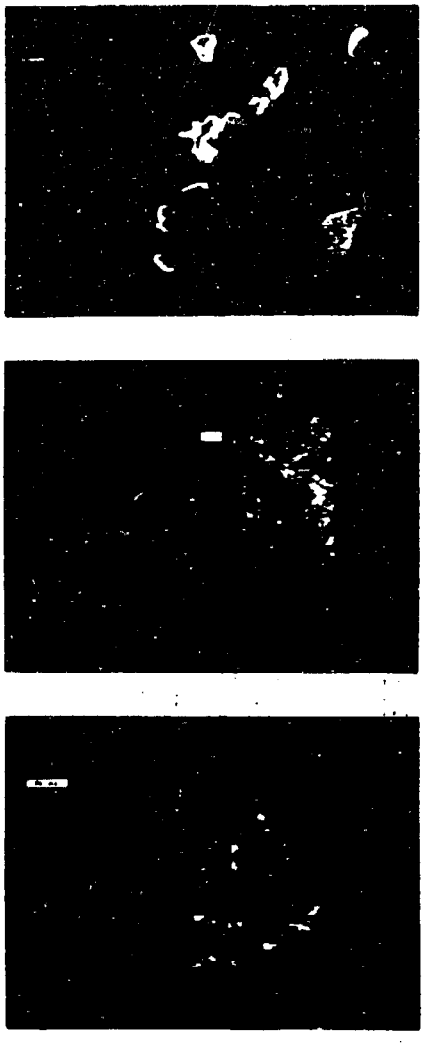
As large areas of the oceans still remain unsurveyed it is essential that the bathymetric contours are supplemented by tracklines indicating the data coverage on which the contouring was based. During the coming year BODC will be digitising the tracklines from the printed GEBCO sheets. A solid state recorder

available for developing the GEBCO Digital Atlas as an authoritative and routinely updateable version of the bathymetry of the world's oceans

## UK Digital Marine Atlas Project (UKDMAP)

The UKDMAP Project was set up at BODC in 1989 with the aim of creating a PC-based digital atlas and reference work on the seas and coasts around the British Isles. Funding for the project is provided jointly by NERC, the Fisheries Laboratories at Lowestoft and Aberdeen, the Joint Nature Conservancy Committee and the National Rivers Authority.

The 'beta-test' version of the Atlas, released in January 1991, has been highly successful. An article in the July 1991 edition of 'NERC News', together with presentations and demonstrations of the system at a number of conferences and seminars, assisted in bringing the Atlas to the attention of a wide range of potential users. During the year 396 requests for copies of the Atlas were serviced and feedback from users has been very positive. The system has proved to be very robust and no bugs have been encountered in the software.



*Sample screen shots from the UK Digital Marine Atlas (Second Edition)*

The user interest generated by the 'beta-test' release has resulted in many offers of new data sets. Data preparation for the next release of the Atlas, both digitisation of printed chart material and processing of digital data, progressed steadily during the year. Some 350 new data sets were added to the Atlas taking the total number available for the Second Edition to 462.

The Atlas now covers a wide range of maritime themes including resources and uses, conservation areas and protected sites, marine geology and biology, physical and chemical oceanography, meteorology, fisheries information, chart indexes and data catalogues. Topics range from sightings of the killer whale to the location of earthquakes; from cable routes and protected wrecks to tidal currents and storm surges; from seabird sightings and plankton distributions to fishing ports and herring catches; and from bottom deposits and iceberg plough marks to marine conservation areas and lifeboat stations.

The development of the user-interface software for the Atlas has progressed well and has included enhancements to the storage structures and display techniques to accommodate the wider diversity of data types being incorporated. These developments will be consolidated into the Second Edition of the Atlas scheduled for release in the summer of 1992.

## Ad-Hoc Customer Requests

The growth in the number of ad-hoc customer requests to BODC for copies of data and for inventory information about data availability continues unabated. During the year 463 such requests were serviced from 238 organisations at home and abroad. Compared with the previous annual high of 323 requests from 140 organisations. When taken in conjunction with in excess of 1000 remote user sessions logged against the on-line BOFS and North Sea databases and the 400 distributed copies of UKDMAP, it will be seen that BODC has had a very active year in disseminating its products.

Of the 463 ad-hoc requests serviced, 44% were for data and 50% for data inventory products, the remaining 6% being enquiries of a general nature and requests for software and advice on data management. Within the UK, requests were serviced for 48 commercial companies, 13 government institutions, 22 universities/polytechnics and 12 NERC laboratories. On the international front BODC provided services to 143 organisations (primarily data centres, hydrographic offices and marine laboratories) in 41 countries.

Much of the growth in demand, particularly from abroad, resulted from the release of two of BODC's PC based data catalogues. Thus, out of 230 inventory requests, 83 were serviced by provision of the International Current Meter Inventory and 66 by the GLOSS Handbook, both of which were made available on floppy disk.

About 90% of the 204 data requests were for sea surface or depth profiles of temperature, salinity, nutrient, chlorophyll or optical data; time series of sea level, wave or current meter data, or digital bathymetry/coastline contours. The data were supplied mainly on magnetic media, such as magnetic tape (39%) and floppy disc (26%), although 20% were serviced by file transfer over computer networks, with the remainder provided as computer plots or listings.


*Source of ad-hoc customer requests serviced by BODC (1991/92)*

**Reprinted from:**
**1991-1992 Report**
**Proudman Oceanographic Laboratory**
**(October 1992)**
Natural Environment Research Council

# ACTIVITIES OF THE US NODC IN MARINE DATA & INFORMATION MANAGEMENT

## Status of Global Data Exchange

Data exchange within IODE continues to be a successful method of building the data resource for ocean and climate researchers. Through the Global Temperature-Salinity Pilot Project (GTSPP) there are now much closer links between IODE and Integrated Global Ocean Services System (IGOSS) data. As a result, the integrity and quality of the global ocean data base is improving. The Data Archaeology project is stimulating increased exchange through IODE of historical data sets which are so important to long-term climate studies.

## Participation in Global Ocean Climate Projects

WOCE Upper Ocean Thermal Data Assembly Centers are being provided with monthly near real-time temperature-salinity data by NODC, through GTSPP. NODC provides operational support to the WOCE Hydrography Data Assembly Center at Woods Hole Oceanographic Institution (WHOI). US data management for the Joint Global Ocean Flux Study (JGOFS) is provided by NODC's liaison officer at WHOI.

The Tropical Ocean-Global Atmosphere (TOGA) project is supported by maintenance of the TOGA Pacific upper ocean temperature data base. Scripps Institution of Oceanography issues bi-monthly temperature analyses from this data base. TOGA Sea Level Center (University of Hawaii - UH) operations are supported by an NODC employee at UH, and the data sets are stored at NODC. Other TOGA data sets at NODC (some via WDC-A) include:

- Global blended Sea Surface Temperature data
- Tropical global ocean subsurface data
- Global surface drifting buoy data
- ATLAS moored thermistor chain and marine surface data
- EPOCS moored current meter data, CTD and XBT data
- Geosat altimeter sea level and cross-over differences data

## Global Ocean Observing System (GOOS) Development

Experience gained through GTSPP operations will apply directly to GOOS. In particular the management of real-time data flows, continuously managed database operations, reconciling delayed mode data with real-time data, and data transfers to customers through electronic networks are important elements of GOOS development. GTSPP quality control is well defined and documented in such a way that researchers can feel confident about the data. This too will be important for GOOS datasets.

## Products & Services

NODC produced a two-disc set of CD-ROMs holding global ocean temperature-salinity profiles from NODC's January 1991 bathythermograph, oceanographic station, and CTD/STD data files. The two disks hold over 3 million profiles in 925 megabytes. Altimeter data from the US Navy Geodetic Satellite (Geosat) are available as enhanced geophysical records from the Exact Repeat Mission on a set of six CD-ROM disks. The first in a projected series of eight CD-ROMs holding Geosat altimeter crossover differences data was produced in August 1992.

A special long-term time-series data set, including global temperature, salinity, density, and nutrients data was produced from the NODC archives as of May 1992. The data set contains data from 27 North Pacific sections, 56 North Atlantic sections, 19 sections from other oceans, plus data from 10 Ocean Weather Stations. Approximately 190,000 stations are in the data set, which will be produced as a CD-ROM in the near future.

A system has been developed for managing real-time AVHRR (Advanced Very High Resolution Radiometer) datasets for selected coastal regions around the US. The system allows remote users to identify the product needed, and its geographic and time boundaries, then review and select from a list of candidate data sets. The data are then transferred directly to the user's host computer.

New Data Types

Even though chemical, biological and pollution data have been successfully managed at NODC for several years, the JGOFS project is producing data with many new chemical parameters. The NODC prototype data base project (Poseidon) is experimenting with methods to document and manage these data.

NODC hosted a US workshop in May 1992 on managing Acoustic Doppler Current Profiler (ADCP) data. As a result, a national data management plan for ADCP data is being developed in concert with US experts in the collection, management, and use of these data.

As a result of the NODC data archaeology project, tens of thousands of water bottle stations have been contributed by the Russian Federation, Korea, and the RNODC (Southern Oceans) in Argentina. In addition, over 80,000 Mechanical Bathythermogram (MBT) records at Scripps Institution of Oceanography are being digitized through a data rescue project.

In a co-operative project between NOAA & NASA, NODC transcribed AVHRR satellite data for years 1985 through 1987 from approximately 2,500 magnetic tape reels and 2,600 cartridge tapes to 105 12-inch optical platters. Each optical platter holds about 6.4 gigabytes, or about 10 days worth of data.

**IODE Development of Technology & Systems**

A prototype relational data base is being tested as a means of having large amounts of data available on-line. Data from JGOFS, GTSPP projects, and all water bottle data (approximately 800,000 stations) from the NODC archives have been loaded. A graphical user interface is also being tested for entry and retrieval of data and information about the data.

NODC is adopting the GTSPP QC software, which was developed by MEDS, as its data processing system. NODC highly recommends the software as a standard within IODE. MEDS and NODC are working jointly to expand the software for delayed mode data and to implement it on PCs and Unix workstations.

Networks are an important part of daily operations. E-mail is used daily, and data are routinely transferred to and from organizations in the US and around the globe. GTSPP real-time operations would not be possible without E-mail, SPAN and Internet.

**Marine Information Management**

As NODC developes the long-term time-series data set, citations to literature about the data are also being noted and will be included with the data on a CD-ROM.

The NOAA Library and Information Network has been very active in several areas of marine information management. It has developed a CD-ROM catalog of library holdings of thirty NOAA libraries and information centers as well as the holdings of the Environmental Protection Agency (EPA). The approximately 80,000 marine entries of the combined NOAA/EPA catalog is accessible through remote access in the United States.

The NOAA Library has provided tapes of its Central Library holdings to the Virginia Institute of Marine Science (VIMS) so that VIMS can load them into the CDS-ISIS software, which is the predominant international software promoted by the United Nations for bibliographic systems.

In 1992, the NOAA Library produced a new bibliography, entitled Ecosystems of the Florida Keys. This bibliography provides citations and abstracts for approximately 600 items in scientific disciplines including: marine invertebrates and flora, with a substantial number of citations to works about oceanography, geology, meteorology, marine mammals and fishes, and terrestrial flora and fauna.

The NOAA Library, working with other libraries in the United States, has suggested alternatives for production and development of the Aquatic Sciences and Fisheries Information System (ASFIS). Four United Nations agencies, including IOC, & US national partners involved in developing this system are reviewing ASFIS.

In May 1992, NODC established an OMNET bulletin board to enhance communication among the Group of Experts on Marine Information Management during the Intercessional period. This has been successfully used by 90% of the members.

The Automated Electronic System for Ocean Pollution (AESOP) is a software application developed by the Ocean Pollution Data and Information Network (OPDIN) to facilitate access to ocean and Great Lakes pollution data bases. AESOP provides access to several component data bases that include descriptions of data, as well as projects, systems, and citations related to pollution data.

NODC produces a quarterly newsletter called the Earth System Monitor under the auspices of NOAA's Office of Environmental Information Services. The Monitor reports on all aspects of environmental data and information management within NOAA, particularly as it relates to the Climate and Global Change Programme.

NATIONAL REPORT OF VIETNAM

**Present Status & Problems of Oceanographic Data Management in Vietnam**

## I.-INTRODUCTION

The Vietnamese National Oceanographic Centre (VNODC) has been founded in 1990 by joint efforts of the Vietnamese Committee for IOC and the National Center for Scientific Research. At present VNODC is the unique civil organization in Vietnam that is responsible for:

- Applying informatics and telecommunication technology into Oceanographic Data Management;
- Searching appropriated way for creating Integrated Oceanographic Data base in the National scale;
- Representing as National coordinator in IODE program;
- Providing oceanographic data services in cooperation with related institutions.

The conditions for VNODC's activities can be specifies as follows:

1.1. Unfavorable:

- Budgetary restriction and strongly scattered data source;
- Oceanographic data and information can not be used effectively in almost all branches of national marine production activities. Therefore the demands for them are quite modest.

1.2. Favorable:

- Qualified and cheap workmanship;
- Recent achievement of PC technology, especially CD-ROM techniques.

According to the Workshop targets, this report intends to present VNODC's gained experiences in such specific conditions and outlines the possible way to strengthen its activities

## II. INFORMATION FLOW ANALYSIS AND THE ALTERNATIVE FUNCTIONAL MODELS OF VNODC.

### 2.1. Information flow analysis.

Oceanographic data and information flow strongly depend on state of marine production and oceanographic research activities. It's clear from Dang N.T. papers [1,2] those marine sciences in Vietnam have rather long history of development and the investigations cover large spectra of phenomena. It's easy to find out that interruption by wars and lacking of operative oceanographic services are noticeable. Since 20 Th. years oceanographic survey on broad sea acquatories and large scale studies have been available only by international cooperation. At present the Vietnamese institutions of oceanography try to keep their

traditional relations with those of French, Russia (formerly USSR), China, USA and to enlarge cooperation with WESPAC countries.

In centralized bureaucratic system of economic management, oceanography was considered as pure natural science. Therefore the main task of elaborating every marine activity should be administrative maneuver. and throughout information and data processing played only auxiliary role.

The new economic management system on one hand forces the oceanographers to be more pragmatic and on the other makes oceanographic information and data more and more valuable.

Above described situation permits to conclude that oceanographic data management in Vietnam has rather good background, but its development must be in accordance with growing need.

More over, it's realized that the effective strategy for developing oceanographic data management depends on concrete features of the information flow in the country On the basis of preliminary sample from 6 organizations a simple conceptual model has been worked out and presented in the Fig.1.

For understanding this model the two systems of classification are important.

Firstly oceanographic materials have been classified as data (original result of oceanographic observation) and information (project reports, research publications, literature on speciality and etc.). On the flow chart (fig.1) are given percentage amounts of data/information.

Secondly, due to strongly scattered sources, the classification on activities' groups may be helpful. In our country they are 3: National marine production (Production), National Marine Research Program (NMRP) and International Cooperation. The last 2 groups are more easy to be controlled than the first.

There are many organizations that take part in these groups of activities producing or consuming oceanographic data and information. Among them Institute of Oceanography (IO), Institute of Marine Products (IMP), Marine Hydro-meteorological Center, Tonkin Bay Research Center (TBRC), Ministry of Communication (GOGD) are the most important

International cooperation is the largest source contributing nearly 80% of oceanographic data in Vietnam. There are 3 kinds of cooperation.

1. Pure Oceanographic survey and investigation.

Since 1920 there have been 7 important international oceanographic campaigner supported by the Governments of Vietnam. For example International Investigation of Tonkin Bay (USSR and China 1960 - 1961). Project NAGA (USA, Scripps Institution of Oceanography 1960 - 1961). Investigation of Typhoons and Oceanography (USSR since 1980). At the same time with this workshop 7 Vietnamese oceanographers are working on the board of the Russian Oceanographic ship "Kalisto", which carries out oceanographic survey in the South - West part of the South - China Sea. Some publication of above mentioned investigations are well known for world oceanographic community Wyrtki K. [3].

2. International project survey and services.

At present international oil and gas survey projects produce and consume the largest amounts of Oceanographic data and information, but for VNODC, the small project

SINHON-2 (Singapore - Hongkong submarine optic cable project) [4] has remained unforgettable practice of international Oceanographic data service. The knowledge of the Vietnamese oceanographers on deep sea hydrological condition [5] was highly evaluated by project manager (Cable and Wireless HK) and successfully applied during survey and design works. The most important VNODC computer equipment was purchased from financial sponsor by this project.

3. IODE program.

IODE program is one of the most important link between the Vietnamese oceanographers and international oceanographic community. The program documents, especially training courses at JODC stimulate application of computerized Oceanographic Data Management in Vietnam.

Thank to IODE program VNODC have got CD-ROM NOAA-01[6] that supplies us with large amount of MBT and XBT data. At this moment NOAA-01 database is being analyzed and by the end of 1992 VNODC will be accomplish all requests for the supplier.

Concerning oceanographic information there must be urgent need for improvement its quantity , quality and management. It can be seen quite abnormal situation. As usual, in a developing country international cooperation is the most important source of oceanographic information, but in Vietnam this normal situation is broken out. At present the international source becomes catastrophically restricted. Therefore the largest amount of oceanographic information is contributed and consumed by project documents of national production activities (see Fig.1). Information lost is great, after processing or utilizing nearly 60 % of oceanographic information are thrown away or diffused in numerous private libraries

In above mentioned complicated state of oceanographic data and information flow VNODC has only direct contact with NMRP and some important sources of international cooperation. The strategy for further VNODC development is intended to increase the role of international cooperation and to stimulate better data/information archive and circulation in the country. For this there have been worked out two functional models of VNODC

## 2.2. The Alternative functional model of VNODC

There are two available functional models of VNODC: centralized and decentralized ones.

According to the **centralized model** by means of planing interference VNODC is permitted to access directly to all groups of activities (see Fig.2). But a detailed financial and social analysis has revealed that the centralized model is not attractive because of 3 reasons as follows:

- A big organization with large budget will be necessary;
- The model will be able to cause unemployment for data management staffs of the numerous institutions.
- The model will not be convenient for the consumers and broke dramatically traditional data/information services. Therefore the centralized model has been abandoned forever.

According to the **decentralized model** VNODC will maintain its own traditional relations, search new ones and conduct negotiation with the related institutions in order to organize the unique system of the **Operative Branches** (see Fig.3).

In comparison with the centralized model, decentralized one has noticeable advantages as follows:

- There is no need to build a new large institution;
- It is possible to involve large workmanship without maintaining the big permanent staff and causing unemployment in related institutions;
- Good activities only of two branches (OB1 + OB2) or (OB2 + OB3) will be enough to stabilize quickly the state of country's data / information flow.

On the basis of above presented analysis, since 1991 experimental implement of the decentralized model has been started. The results of this implement are briefly described in the following paragraph.

## III. PRELIMINARY IMPLEMENT OF THE DECENTRALIZED MODEL

Since 1991 VNODC has been able to overcome the principal financial and organizational difficulties and implementing of the decentralized model can be considered as successful.

### 3.1. Staff, working place and budget

The permanent staff of VNODC is very small and consists of 5 persons. The kernel (scientific collective) of the flexible staff, that is formed according to the concrete data management project, consists of 15 persons. There are 5 persons with degree of doctor of sciences in it.

VNODC working place consists of 2 working rooms and the store with total area of 60 $m^2$.

The preliminary fund for purchasing equipment was 7.500 $ US. Since 1993 the permanent annual budget will be not less than 15.000 $ US. This budget permits VNODC to involve in data management projects the workmanship of more than 300 persons per month.

### 3.2. VNODC's operative scheme and hardware communication

VNODC's operative scheme and hardware equipment are completed with intention to satisfy above mentioned specific features of data management in Vietnam and fully oriented by the device "PCs in mainframe out". It can be seen on Fig. 4 that the hardware configuration is able to meet the technical request of important for us Ocean - PC and experimental CD-ROM projects.

At present VNODC possess two PCs - 386 and peripherals included Digitizer and CD-ROM reader (see Fig.4). The hardware permits to handle effectively the integrated data base on floppy disks, to read CD-ROMs and to accomplish almost all kinds of oceanographic data / information service including small tirage publication.

### 3.3. Software and software interface.

Almost all DBMS of VNODC have been developed in WINDOW 3.1 environment (see Fig.5). There are 3 main groups of software: Geographic Position Management System (GPMS), Image and Chart Management System (ICMS) and Printer Manager. The last is

licensed to VNODC by the informatics companies mainly ADCOM - Group. But GPMS and ICMS are being developed by VNODC's flexible staffs sponsored by the National Center for Scientific Research.

GPMS is developed under the directorship of Dr. Hoang X.N. based mostly on the experiences gained after the training course at JODC and studying the Project CD-ROM NOAA - 01. The experimental version of GPMS is written in BC - 7 environment, which allows to run all modules written in Microsoft GW - Basic, FORTRAN 77 and C. The kernel of BC 7 environment is the programs development system Basic 7.0.

The version GPMS 01 will be accomplished when the version GF3 level 4 for PCs will be available for VNODC and through out studied.

ICMS is being developed under the directorship of Dr. Nguyen V.H. in cooperation with the Data Centre of the General Department of Geology. This is rather more complicated programming project than GPMS (see fig.6). Although ICMS is developed basically in the environments of ACAD 1.1 and FOXBASE, the access to GPMS's data base is available.

At present the experimental data update and data service programs of GPMS and ICMS has been successfully tested. Both systems are able to accomplish various kinds of data services.

Besides of software projects related to oceanographic data management, VNODC has initiated CDS/ISIS project, that intends to develop computerized marine information management. Thank to the help of the Institute of Scientific and Technological Information the version ISIS 2.3 has been customized for Vietnamese and installed in one of our PC-386. An experimental ISIS data base consisting of more than 2000 references related to ASFIS has been created, but it can not be able now to satisfy the international standard.

### 3.4. International cooperation.

It can be seen on the fig. 1 that international cooperation must be one of the most important fields of VNODC's activities.

Traditionally the Vietnamese oceanographic community has provided its contributions to the international programs only via cooperation with USSR (now SNG) and USA. It's pity that the regional cooperation is in very poor state of development. With the establishment of the "Open Door Policy" VNODC has got the possibility to take part directly to many international programs and to enlarge its relation with the regional NODC. For the beginning in 1992 the most important international activities have been planned as follows:

- To take part in the International Workshop on Oceanographic Data Management at JODC (November);
- To take part in The 14th Session of The Committee on IODE (November),
- To provide IOC general secretary Dr. G. Kullenberg with all necessary conditions for inspecting VNODC works (December);
- To elaborate with the help of Mr. A. Varley a project for developing marine information management at VNODC that will be submitted to UNESCO and FAO;
- To accomplish the requested comments on the experimental CD-ROM project NOAA-01 and to submit them to WODC-A.

Besides above mentions activities, VNODC tries its best to create favorable conditions for all visitors from the regional NODC.

### 3.5. Products of VNODC data/information service.

The existing hardware ,software data base and international relations allow VNODC to begin data/information service successfully at local and national levels. Three typical kinds of products are:

1- **Free -charge data service** for the national oceanographic community. For example, CD-ROM NOAA-01 has been updated into GPMS data base and the concrete forms of free-charge data service has been informed to related institutions. This kind of service is welcome every where in our country;

2- **Commercial data service** via World commercial network of Data Banks. This kind of service is not attractive for the local users because of high cost [7];

3- **Small tirage low cost publication.** VNODC intends to become an important publisher of marine sciences literature in Vietnam. At this Workshop 4 various examples of publishing works are presented.[8-11]. It is great success that VNODC has been able to reduce the cost lower than 20 cents per unit.

## IV. PROBLEMS AND REQUESTS.

VNODC has not yet wide working contacts with the international community especially regional one. This restriction has made a lot of difficulties for developing its activities. Therefore at this workshop we would like to present our most urgent requests for international cooperation. They are the following:

1. To elaborate the most convenient way to link VNODC to the World and regional network of NODCs;
2. To assist in making VNODC data management software compatible with the standard of Ocean-PC project especially the CD_ROM development;
3. To provide VNODC with the complete free-charge oceanographic data base concerning the South China Sea;
4. To include in training strategy the possibility to organize the training courses on oceanographic data and marine information management at VNODC with participating of experts and people from the regional NODC;
5. To clarify the charge and the benefits of VNODC in the case of participating in the Large Scale Investigation Projects such as GOOS, JGOFS, WORCE by concrete sub projects. For this two important facts must be taking into account:
   - -VNODC has very small annual budget but large possibility to involve in suitable sub projects the necessary qualified workmanship;
   - -VNODC is able to organize oceanographic survey on the permanent sections of the South China Sea and for this the only help on purchasing and maintaining oceanographic equipment is requested.

It is certain that above mentioned assistance is necessary for VNODC to overcome a short period of training and developing services for entirely national benefits and then to reach the state of providing fruitful contributions to the regional and global efforts.